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INCUBATOR

AND ITS USE.



THE IMPROVED MONARCH INCUBATOR.

—BY—

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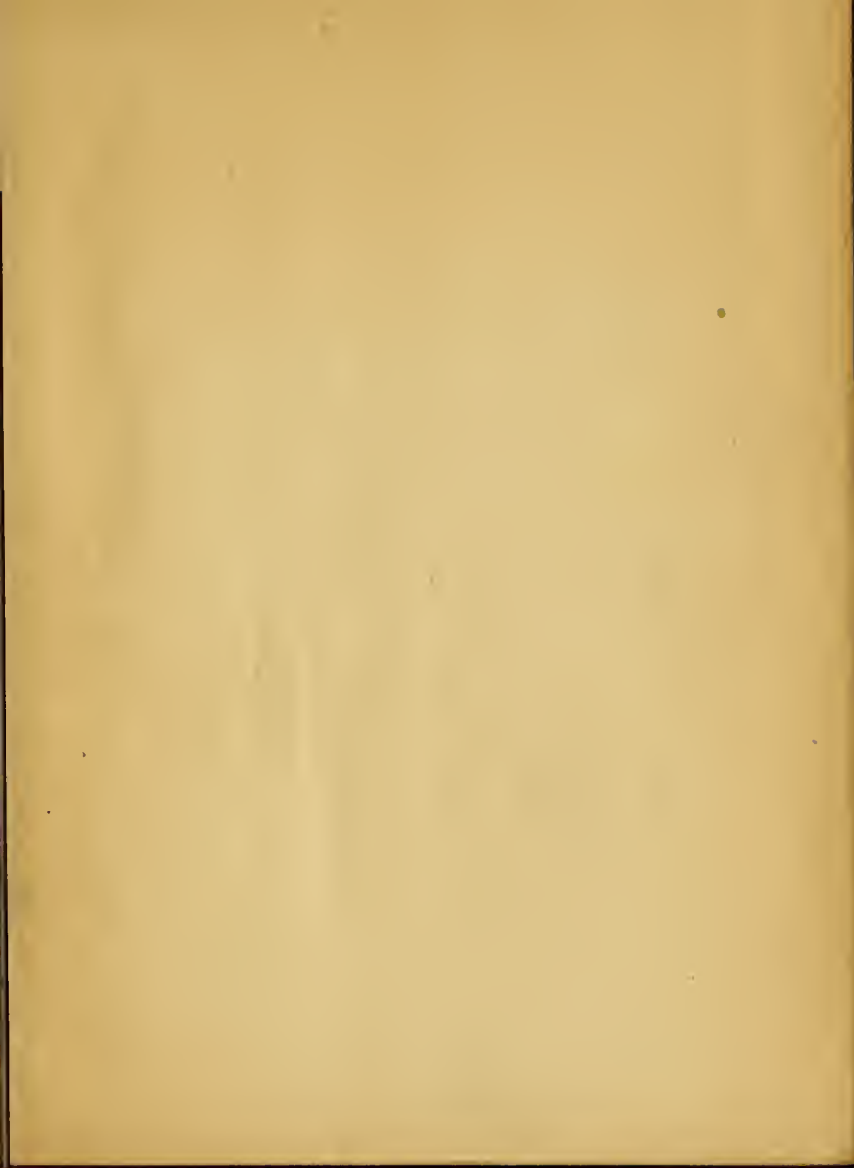
INV. 80

OUR IMPERIAL PEKIN DUCKS



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The Incubator and Its Use.

BY JAMES RANKIN.

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I am induced to place this little work entitled "The Incubator and its Use," before the public for various reasons. One is, that we are constantly flooded with letters from all parts of the country asking innumerable questions on the subject, of which the following are specimens: "Which is the best incubator?" "What is the proper degree of heat to run?" "Is electricity a good regulator?" "How much moisture shall I use, and when?" "Is a hot-air machine as good as hot water?" "What is an incubator?" "How does it look?" "How often do you turn your eggs?" "How do you manage when chicks are coming out?" "Please give me the whole thing in detail?" "What is your percentage of hatch?" Of course, with a correspondence of from fifty to seventy letters per day, the detail business is out of the question. Another reason is, that there is a great deal of ignorance and prejudice prevailing regarding the use and utility of incubators. Many never heard of one and are plodding quietly and contentedly along with the old hen. Others say that it is an unnatural way of doing the thing and never can succeed. Others still have had bitter experience in the use of machines and have lost their chicks through the use of still more worthless brooders; they have become skeptical and denounce the whole thing as im-

practicable. Many are groping in the dark, wishing to know and anxious to learn all they can of the business and are willing to pay well for the knowledge, but there is no work in existence, as yet, that will cover it ; and it will be years before the subject will be mastered in all its details. For more than thirty years I have been carefully experimenting with incubators and the system of incubation. It has been to me a long course of patient study and scientific investigation, with a gradual gain and steady improvement for the better ; with the dark places showing a glimmer of light ; obscure points being made plain. But the end is not yet. I am no longer young. The infirmities and decrepitude of age are slowly creeping upon me and admonish me that my days of research are nearly over and I find that life is all too short ; but there is a satisfaction in knowing that others will take it up and carry it on to the end. I predict a great future for the incubator. With me it has been a decided success ; and if the rehearsal of my experience will make the business of growing poultry of all kinds as profitable to the reader as it has been to me, I could wish him no better fortune.

The first question for the would-be poulterer to consider is not, as one would naturally suppose, the choice of a good incubator, or even the selection of a suitable locality contiguous to a ready market. These are all necessary in their place, but there is something that should antecede even these.

HIS FITNESS FOR THE WORK.

He should take an exact and minute account of his stock in hand. By this, I do not mean the financial part of it, for that is secondary, as it requires a comparatively small capital to do quite an extensive poultry business, but he should first examine himself carefully to see whether he has the qualifications for and the ability to run the business successfully ; whether it would be congenial to his tastes. He should have an innate love for the little pets so soon to be under his charge, as well as a natural antipathy to all vermin and filth. It would be of little use for a person to

engage in a business for which he has a natural dislike, and do penance all his life long, simply because he thinks he can make a little more money at it than in something else he likes better, for in all probability in this country of sharp competition, those who have an aptitude for the business would be sure to supercede him and drive him to the wall. The question then for him to decide, is not whether the artificial system of hatching and of growing poultry is superior to the natural, which is the best incubator, where the best location, whether he had best construct his plant with a view to the production of eggs or young birds, or both. These questions have, in a great measure, been decided for him by the experience of others. It is - if he had better engage in it at all ; whether he is willing to put in the systematic care ; the intense application ; make the personal sacrifice absolutely necessary to carry on this successfully ; to devote fifteen or sixteen hours of the day, for six months of the year, that he may make as much with the same capital, as he could expect to in any other vocation during the whole year. I say six months, because during the remaining part of the year, in the care of store fowl, the duties are comparatively light and the hours short. I have often had persons who had abandoned the business after running it a year or two, assure me that they had found the business fairly profitable and that they had been successful, but that they were not going to make slaves of themselves for the sake of a little money ; when the real truth was that they had no aptitude, no enthusiasm for the business, not love enough for their little pets to carry them through. The profits derived from the business, though large, did not, in their opinion, cancel the personal sacrifice required. Within the last decade numbers of ladies have engaged in the business, thinking it well adapted to female muscle and temperament, but who, after a year or two of trial, felt constrained to give it up, the work attending it being too severe. It is strange, but true, that a great many people engage in the poultry business to get rid of work. Men who have failed in nearly every department in life through want of energy, perseverance or executive ability, attempt growing poultry and eggs as a last resort, because "there is

nothing to do." They do not even attempt to qualify themselves for the business, for they have only to fill their machines with eggs and at the end of three weeks take out their chicks, put them in brooding houses, grow them to a suitable age, and then put them upon the market at fabulous prices. These men have little idea of what they have undertaken; no conception of the trouble in store for them until taught by bitter experience, that in poultry growing, vermin, disease and a sad mortality are sure to follow in the train of inexperience and neglect. I will give an instance, which is only one of many, that has come under my own immediate observation.

EXPERIENCE OF AN AMATEUR.

In the fall of 1885, a gentleman called at my place, stating that he was about to enter the poultry business: had heard of my success, and wished to get incubators, breeding stock, supplies of different kinds, in short a general outfit; but forgot to say that he needed any counsel, advice or instruction with them. He was a man of some 56 years of age, and I found, on inquiry, that for fifteen years he had been a popular captain of a line steamer between here and Europe. He was a very gifted man, master of several languages, a brilliant conversationalist; had traveled extensively, associated with many of the dignitaries of Europe, shot tigers in India; had captured a young wife, and was now about to settle down and take comfort raising poultry. I could not help liking the man, but he was so full of confidence that I felt that he had some bitter experience before him. And I said to him, "Friend, this is something of a trade you have undertaken; have you thought it up in all its bearings?" [He had already bought a place with some 90 feet of poultry buildings, and intended to keep 1,500 hens.] "I do not wish to sell you machines and breeding stock if, by so doing, I am going to injure you financially. You can easily walk the quarter-deck of your ship and delegate instructions to your subordinates, because you understand navigation thoroughly *yourself*, but how do you expect to run a business successfully in which you have had no experience, and delegate instructions and advice to

hired help when you are completely ignorant yourself?"

Said he, "There is no such word as failure in my vocabulary. I never undertook a business yet but that I succeeded in it, and I am not going to fail in this."

There was nothing more to be said. I sold him his supplies. I heard but little from him till warm weather opened in the spring, when I received a letter saying, "Come up at once; something ails my fowls; I am losing large numbers." I went, for I had been expecting a call, and had no little curiosity to know how he was coming out. As soon as I saw his fowls and noted their pale combs and faces dull, lustreless plumage and languid movements, I knew at once what his trouble was.

On examining his buildings I found, as I expected, that the perches, together with every crack and crevice, were literally filled with little red parasites; so numerous that they were sapping the very life out of his fowls, and he did not know what his trouble was. Of course, the broiler business was a complete failure; what few eggs he got had little or no vitality, the germs dying, most of them, within a week. Well, he chronicled failure for the first time in his life. He threw up the business, entered government employ in the capacity of American consul to one of Europe's noted powers, which office he has filled to the satisfaction of all.

This man is a fair specimen of the many failures chronicled in the poultry business. The failure of others has no terrors for those of a sanguine temperament. Caution is not one of their attributes. Self complacency is—they are entirely above advice, and yet one failure is usually enough to completely discourage them. They simply say, "it can't be done, I have tried it and know."

Securing strong, vigorous germs will be alluded to later on, as that is a vital part in the business.

Any one desirous of getting a living by growing poultry, should make up his mind to do it artificially or not at all; for whoever attempts to grow poultry for the market in the natural way, must expect to take second place. He may get a meagre living at it, but he will be constantly pushed to the

wall, because the natural method is just as much behind the artificial as hand work is behind that of machinery in our large manufacturing establishments. I will give some of the reasons why, and the reader can judge for himself. Try as you may, when you get your natural-grown broilers into market, you will find artificially-grown chickens there ahead of you. They not only control that market, but have controlled it for weeks, perhaps months, and you will consequently have to take a reduced price for yours, for you will surely meet a falling market; and my experience has taught me that the first six weeks of the high prices secured from the early spring market, represent more profit than all the rest of the season put together. Again, faithful, intelligent help is, in these times of degeneracy, not only the most difficult thing to procure, but the most expensive thing to have that the poultry grower has to contend with.

SUPERIORITY OF THE ARTIFICIAL OVER THE NATURAL.

In artificial practice the labor expense is reduced to a minimum, for it is just as easy to care for a brooder with 150 chicks or ducks, as it is to care for one old hen with a dozen, while you have everything under better control. Again, the saving of labor in incubating artificially is immense, in fact beyond the comprehension of any one who has had no experience in both. I had far rather care for a good incubator of 600 eggs than one old hen with a dozen.

When I compare the present method—with a large number of machines running under perfect control, each doing the work of fifty hens—and my former practice thirty years ago, with 100 to 200 sitters, nearly the whole day consumed in setting, feeding, changing and washing the eggs, which the perverse bipeds had smeared with the contents of those they had broken; when I canvassed the whole town after sitting hens, paying fabulous prices for them, only to find a large share of them doing their sitting standing up, I feel thankful that such a load of responsibility has been taken off my shoulders. I have often thought that where one runs the

whole season-through, that the price of a machine is often balanced by the eggs saved, by the better hatching done with a good machine, than that which may be done with the average hen. I do not pretend to say that a machine will hatch any better than a good hen, but there are so many hens that prove refractory, breaking their eggs, forsaking the nest when but half through, and "raising Cain," generally, that the odds are always in favor of the machine. The ease with which large numbers of chicks can be cared for in the artificial process is astonishing to those who have never run the business both ways. When caring for a *brooder* of chicks, you have far better control of both mortality and growth. For instance, the 10th day of April, I put 300 Light Brahma chicks into two of my out-door brooders ; to-day, when four weeks old, I have lost less than one per cent. and there is not a stunted chick in the lot. Does any one pretend to say that he could have consigned those chicks to the care of twenty hens, without going out in the morning and finding more or less of the little things crushed to death, under the feet of the ruthless bipeds, and that the little heads and bodies of the chicks would not have been covered with vermin, and that dysentery, sore eyes, blindness, and other attendant evils would not have followed in train, and that his average mortality would not have reached five, ten, or even fifteen per cent.? If so, his experience has been far better than mine has ever been.

ARTIFICIALLY GROWN POULTRY THE BEST.

You will find persons on every side who will tell you that artificially grown poultry is unfit for food ; that their flesh is invariably tasteless, insipid, and unhealthy, because it is grown by an unnatural way. Now all this is simply contemptible nonsense, indorsed by parties who are ignorant and inexperienced, or who are interested in growing it the natural way ; for you have far better control of the mortality and growth of your chicks through the artificial system than you can possibly have when grown under hens, for the whole thing depends upon yourself—not the old hen. You can make the conditions better, and can grow flesh, feathers and bone

at will. How the old hen can impart vitality to her chicks by a lavish distribution of vermin and filth, is something beyond my comprehension. Years ago, parties who visited my place would say: "Do you pretend to say that these chicks and fowls were all hatched in incubators and grown in brooders?" "Yes, and their ancestors for generations before them." "Why, we expected to see a lot of refuse fowls, and they are the handsomest fowls we ever saw in our lives." All this has been changed, as they expect to see better fowls when artificially grown, and they are not disappointed. I do not refer to my own establishment alone in this respect, for there are many others who are quietly running in this State and the adjoining ones, who are turning out from 3,000 to 10,000 chicks and ducks annually at a profit, furnishing the families of their owners with all the necessities of life and many of its luxuries; giving useful and healthful employment to the boys and girls, as well as laying up a surplus for future contingencies in the shape of sickness, decrepitude and age. In fact, we have already conquered a large share of the prejudice which formerly existed against artificially grown poultry; and the Boston poultry dealers, the most prominent of them, acknowledge that artificially grown chicks take the lead. Many of the leading fanciers, who formerly bitterly opposed the artificial method, now concede the point. One of the most popular, who five years ago publicly denounced the whole system as a failure, simply because the whole process was contrary to nature and no one could grow anything but dwarfed, stunted and unhealthy chicks, now as publicly acknowledges that the system is a necessity for growing market poultry, because the natural cannot possibly compete with it; and that even pullets can be grown artificially which will feather well and score high on the the fancier's card, but that he does not want a cockerel sired by an incubator. What a nice distinction! Just as though the same conditions that would grow a first-class pullet would not produce a first-class cockerel!

WHAT THE MARKETMEN SAY.

In conversation with the proprietor of one of Boston's

noted poultry markets last week, he told me that he handled over 1,500 chicks from W. H. Harris's poultry yards, and, said he, "They are the best chicks I ever handled; in fact, the best I ever saw, and I have been in the poultry business a good many years; I paid him four to five cents per pound more for these chicks than for those from any other source, and if these are specimens of artificially grown chicks, I want no other."

Many more of the prominent Boston dealers are ready to testify to the same thing. This is an acknowledged victory for the artificial system. The incubator has come to the front and has come to stay.

LOCATION.

The location of a poultry plant is a matter of great importance to the incipient grower, whether he locates near or at a distance from good markets; contiguous to or several miles from a railroad station; in a region where ice and snow are natural consequences six months in a year, or where there is very little trouble from either, more than a few days at a time. The business will involve constant communication with the depot, and this should be taken into consideration when locating a plant. The distance is of minor importance, providing facilities for transportation are good. We are located 250 miles from New York and but 25 miles from Boston, and while the express rates to Boston are nearly one-half cent per pound, the rates to New York are only three-quarters cent per pound. The confinement of fowls in a rigorous climate, though necessitating a little more care and attention on the part of the poulturer, does not necessarily affect the egg production.

FERTILITY OF THE EGG.

That the fertility of the eggs is affected by close confinement is beyond doubt, and yet I am convinced, by my own experience, that with intelligent care this can be easily overcome. During the rigorous winter of '64, when the snow was nearly two feet deep around my poultry houses the entire winter (and though I kept Light Brahma fowls) my eggs were

unusually fertile—nearly every egg bringing out a strong and vigorous chick, and that with only soft feed, with the usual ingredients, in the morning; corn and oats at night. But there was a fish market near me, and I had access to the offal—largely from eels—which was fed every other day. The intestines of the fish were easily disposed of, but the eighteen inch skin with the head attached was quite another thing; it was very easy for a fowl to seize a skin by the tail and swallow it as far as the head; that was an insuperable objection; but there was little time left for effort, for another fowl would seize the lower jaw of the protruding head and that skin was resurrected in a moment, leaving the astonished and disgusted biped to ruminate on the mutability of all earthly things, yet not one whit discouraged. These eel skins were swallowed and disgorged with amazing rapidity and a dose of this would do duty for a whole day for a flock of thirty fowls. The offal together with the exercise were the conditions required, not only to insure fertility, but such an egg production as I have never seen equaled since. But this subject of fertility will be treated more fully later on. In locating a plant, the slope should be toward the south, if possible—buildings facing south-east. Select sandy, porous, soil, as that will both absorb and disinfect. Avoid a hard, clay soil, unless good drainage is to be had. An incubating house is necessary where business is to be conducted on a large scale; it should be built with a view to avoid thermal changes or all extremes of heat and cold; for though the most of our self-regulating machines can be gauged to run in any temperature, yet all will run easier where the change is not great.

WHAT MACHINE TO USE.

The next question which naturally presents itself is, what machine to select, from the many now before the public, each of which are better than all the others. It is the one question which comes to me from every side, "What machine would you recommend me to use? they all hatch 100 per cent. on paper." Now, being a manufacturer of incubators myself, this is a very delicate question for me to answer, and not a

wise one for them to ask, for if they considered me honest, they could hardly consider me disinterested; for, the conditions being the same, I would naturally recommend my own machine and my advice would be taken with a grain of salt. I have always made it a rule to let other machines and their makers alone as much as possible, and confine myself entirely to the representation of my own.

In giving the public the benefit of my experience of thirty years in the use of incubators, it will be done largely for the public good and also with the hope of answering many queries which I find excessively tedious to answer by letter. In doing this I shall point out some of the defects which have existed and now exist in some of the machines before the public. I shall mention no names and will be as careful of the reputation of every machine and its maker as possible, and throwing all the light I can on the subject, with a view of increasing public confidence in artificial incubation. That a great deal of skepticism prevails in regard to the incubator cannot be denied. There is always a class in every community who condemn everything new, looking upon it in the light of an innovation. They are bound to travel in the old ruts themselves and cannot be induced to clamber out, even when they can see over the edges. I confess there is some show of reason in their hatred of the incubator. There is hardly a community or hamlet in the whole country but what has had its experience with an incubator, bogus or otherwise. The anathemas and curses, loud and deep, which have been hurled at the heads of their luckless inventors, the depleted pockets, ruined hopes, together with the distrust engendered in the minds of the deluded purchasers of these machines, are sad to contemplate; but how can it be otherwise? The inventors of these machines may be honest in their ignorance, but they are not practical. Perhaps they have never hatched or grown a chick in their lives and have no idea of the first principles of artificial incubation; but they have discovered a heat regulator, built a box around it and called it an incubator, and are confident it will supercede all its predecessors. These machines are thrust out upon an ignorant and confiding public

and guaranteed, on *paper*, to hatch as well as any other machine, even a little better (they are obliged to), in order to secure patronage. Here is a machine, cheap, perhaps poorly built, possessing but one of the many essential points necessary to a good machine, the inventor of which not only cannot run it successfully himself, but cannot send out lucid instructions with his machines so that his ignorant patrons can run them. Is it strange that people feel that their confidence has been both misplaced and abused and that a distrust of all incubators is engendered in the public mind?

AVOID NEW MACHINES UNTIL THEIR REPUTATION IS ESTABLISHED.

Judging from the past, more than three-fourths of the incubators invented and placed before the public have either proved worthless or have been crowded to the wall by their more successful competitors. For instance, in 1885 the greatest incubator contest that this country or even the world ever knew was held in Madison Square Garden, New York, some thirty machines competing; of those thirty machines but three are now before the public.

I have often received letters from parties who have been victimized by bogus machines and complaining bitterly of their experience, and denouncing not only the machines but their inventors, and the makers of all other machines as well, as unmitigated frauds, and swearing they will never invest in another incubator unless they can first have it on trial.

As a rule, I have never been partial to single cased machines, for though they may do very good hatching, especially in warm weather, yet there is not a shadow of doubt but that they would do much better with a good double case surrounding them; and the man who does not take interest enough in his machine to put one there, cannot be very anxious for its success.

The moral of this is, that it is always safe to let new machines alone till after they have won for themselves a reputation. There will generally be enough who are looking for something new and whose pockets are deep enough to justify

them in investing in them, and who will sooner or later develop what good traits they may have, if any.

NON-REGULATING MACHINES NOT DESIRABLE.

Again, I would not recommend non-regulating machines for general use, for though they may hatch a great many chicks when carefully handled and prove good discipline to their operators, yet to a careless or a nervous man they would be any thing but satisfactory. There are those who use them, keeping them close by in a convenient place, tend them carefully, and really do good work with them. I ran one of these machines for ten years and hatched over 1,000 chicks with it each season during the winter, and my neighbors thought I had wonderful success; but at the same time I am perfectly satisfied that the same eggs and one-third of the care that gave me 1,000 chicks in that machine, would give me 1,500 with the machine I now use. But this is not all, when I think of the mortality I then endured notwithstanding my best efforts, compared with the trifling loss I suffer now, I often wonder I did not get discouraged, as hundreds of my contemporaries did, and throw up the business as impracticable.

The reader will bear in mind that this was thirty years ago, when incredulity and doubt was the order of the day and no one ever thought that the artificial method could be made a success. Those chicks came (a large proportion of them), bound to die at all hazards, and no amount of petting and coaxing would induce them to reconsider their decision; now they come out bound to live until the knife ends their days and yet the same brooders were used, the same care bestowed *then* as now.

CHICKS DEBILITATED DURING INCUBATION.

What was the trouble? Simply this—the conditions were not right during the hours of incubation; the vitality of the chick was impaired during the hatching. A gentleman called at my place a few days ago; said he, “I think I have made a discovery which will throw some light on artificial incubation. I have a neighbor who is a very careful

man (much more so than I am), and as you know we are doing considerable in the poultry business. We are using different machines, but eggs from the same source. I get out ninety per cent from my eggs every time, while, do his best, he cannot get out over forty per cent. My chicks come out bound to live, while his come out weak, feeble, many of them deformed and seemingly bound to die and no amount of care can save them. Now with the same brooding system and feed, while my loss is less than five per cent his is simply enormous. He visits my brooding house freely, but will not allow me to enter his. He says he is ashamed to and as near as I can find out he has very few chicks left."

A lady from Wisconsin in writing me, says: "I am feeling so much encouraged in my poultry business. As you know, the neighbors as well as myself have been using different kinds of machines in the past with very indifferent success. The mortality among our chicks has been frightful. Hitherto we have laid it all to defective brooders and brooding systems, but I have now discovered the true source. Out of over 1,400 chicks and 400 young turkeys and ducklings from the two hatches in my new machines, one-half of which are six weeks old and the other half two weeks, I have lost but 14 all told, less than one per cent. They are the strongest chicks I ever saw; it is a pleasure to care for them. This is one long step in advance and has thrown the light on at least one obscure point and made success almost a sure thing." The subject of brooders will come up later on, but let me here state that as much depends upon good brooders and their intelligent management as upon good incubators.

For the space of ten years, during and previous to the war, I wrestled with one of these defective machines with very unsatisfactory results, but too ignorant to locate the trouble; it was a time of ignorance. There were few or no machines in the country. The public were entirely skeptical in regard to this method of introducing poultry into the world. Indeed, I was very much of that mind myself and became more so as my experience progressed, for that experience was all in one direction, that of discouragement and loss, and what few chicks

I got were in no condition to live. They represented every species of deformity to which the feathered tribe are subject, keeping the old hens, to which they were consigned, in a constant worry with their weakly complaints, dropped off one after the other and were soon among the things that were. Eventually I found the source of trouble to be a total want of uniformity in the egg chamber, and this is the most essential point in a good incubator, uniformity of heat in the egg chamber. I need not say that this can only be obtained by a uniform distribution of the source of heat, whether it be water or air. Ventilation has very little to do with it so long as it does not disturb the uniformity; neither has moisture so long as it is not excessive, as I have repeatedly obtained good hatches from perfect eggs when no moisture was used during the entire hatch.

DEGREE OF HEAT REQUIRED.

A variation of one degree is immaterial. It is safe to to run a machine between 101° and 113° , making 102° the objective point. Greater latitude is unsafe and will always tell more or less on the condition of the chick as well as upon the percentage of hatch. Always remember that the number and vitality of your chicks will depend largely upon the latitude allowed your machine and that chicks can be killed inside of your incubator as easily as inside your brooder, and that the machine that will turn out the greatest percentage of chicks from a given number of eggs, will usually turn out the strongest and best chickens, simply because the conditions have been the nearest right to favor their perfect development. I will say here that there are many other causes which contribute to weak constitutions in young chicks and a natural consequent mortality; such as close interbreeding; being careless and inattentive to the wants and comfort of the mother birds during close confinement in rigorous weather. To the expert, caution is unnecessary; he has the whole thing under perfect control. I have often seen cautious, thoughtful young men of limited means, start in the business and by careful attention to details and close application, increase it

to large proportions within a year; while with others of a different temperament it was only a series of blunders and mistakes all the way through, requiring line upon line and precept upon precept. It has needed but the experience of the past year to convince me that the business is not only a far more profitable one, but is a surer and safer one, than any other farm product, including vegetables, cereals, beef and pork. The results of these experiments will appear in due time.

FERTILIZATION OF THE EGG.

It will be needless for me to give you the chemical analysis of the egg, the proportion of albumen-carbon, carbonite of lime of which the egg is composed. Suffice it to say that in order to have a goodly quantity and quality of eggs in winter for incubating purposes, fowls must be well housed and fed, protected from the extreme cold in winter and fed with food in which the different ingredients of the egg are largely held in solution. For instance, it will not do to feed fowls on corn and wheat alone when confined in winter, as such food is highly carbonaceous and one could not look for a high egg production, but should supplement it with green rye, refuse cabbage, potatoes, turnips, clover, rowen, etc. Such food is highly nitrogenous, and when combined with wheat, corn and oats will, if judiciously fed and combined with proper exercise, ensure a liberal supply of good fertile eggs. As testing the eggs is a very important and necessary part of the incubating business, I will describe the method of doing this, also the description of a good egg tester which can be readily made by an amateur in ten minutes. Take a common oblong box, perhaps 10 inches square and 18 inches long, make a hole in the bottom about three inches in diameter, nearly opposite the blaze of your kerosene lamp when standing on the inner end of the box. Nail over this hole a piece of an old rubber boot-leg with a hole about the size of an egg. Put your lamp inside of that box some evening and yourself on the outside, hang it up just over your egg-tray, and you have the best thing out for a tester; you can easily trace the veins in the embryo chick, and the first signs of fertility as they appear.

This will be illustrated by cuts and descriptions of the egg as it actually appears at different stages of incubation.

If a duck egg is carefully examined, after being subjected to a heat of 102° for twenty-four hours, a small dark spot will be seen about the size of a large pin head. This little spot, if the egg is gradually turned, will always float over the upper surface of the egg. This is the life germ and the first indica-



FIGURE 1.

tion of fertility in the egg, and is represented in *Figure 1*. At the end of forty-eight hours this dark spot will have nearly doubled its size, and a faint haze will appear around its edges a shade darker than the surrounding contents of the egg. This haze is the first appearance of the blood veins radiating out from the germ.

Figure 2 shows how the egg appears at this date with the air-cell slightly enlarged. At the end of the third day the dark spot, which is the heart of the embryo duck, can still be seen; but not so distinctly, because a dark circle some three-quarters of an inch in diameter will now appear in the upper surface of the egg, in the centre of which the dark spot is visible. This circle is several shades darker than the rest of

the egg, and no matter how the egg is turned will always float in its upper surface.

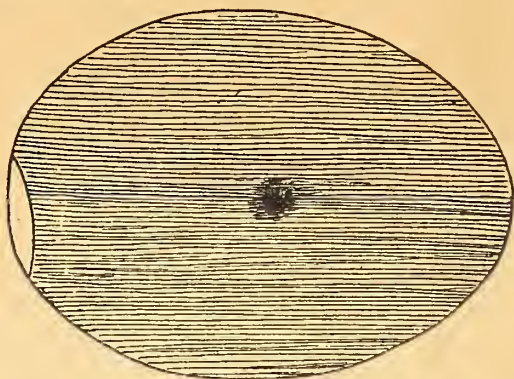


FIGURE 2.

Figure 3 represents the egg at this stage, with its enlarged air-cell.

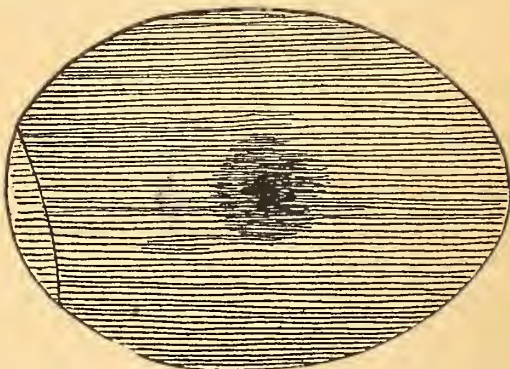


FIGURE 3.

Figure 4 represents the egg as it appears at the end of the fourth day. The circle surrounding and enclosing the germ

will have nearly doubled in size, and is of a still darker hue ; indeed, the whole contents of the egg is perceptibly darkened. If the egg is broken carefully at this date a delicate tracery of veins will be found to have enveloped the entire yolk of the egg, all originating from the centre or heart of the embryo ; the pulsations of which (if the shell is removed) can now be plainly seen with the naked eye. This net work of veins cannot be plainly seen with a common lamp, but with a powerful glass are very distinct. This latter is not at all necessary in

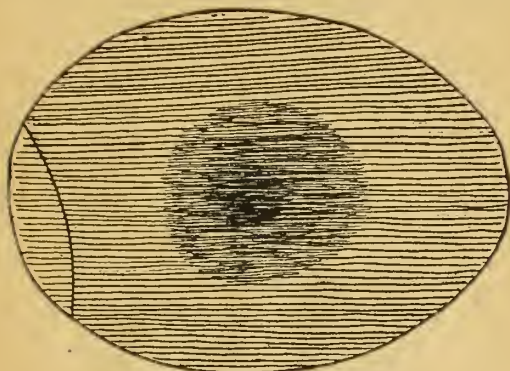


FIGURE 4.

testing the egg. The discovery and locations of the minute organisms may be interesting to the scientist, but not at all necessary to the operator, who simply wants to be assured of the life and health of the germ. This he can readily determine from the increased size and gradual development of the circle; it now assumes a darker shade, also the contents of the egg. Up to this time I use no moisture, and the contents of the eggs have gradually evaporated and the air-cell proportionately enlarged. This air-cell is slightly enlarged till the tenth day, when no further evaporation should take place. About three days before hatching the rapidly developing duck will gradually diminish the size of the air-cell, leaving himself just

room enough to work out. Nature, in the case of the old hen, provides for her own contingencies, while we must resort to art to obtain the same conditions. While incubating under the hen during the first few days, the egg evaporates rapidly. Then the pores gradually become coated with an oily secretion from the feathers of the hen until evaporation ceases. Now, we cannot successfully fill the pores of the egg, it is too delicate an operation to attempt it; but we can easily obtain the same conditions in another way, and that is to prevent the further evaporation of the egg by vaporizing water in the egg-

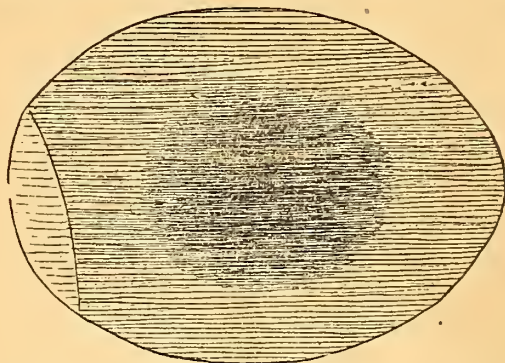


FIGURE 5.

chamber, so that evaporation will not take place. Exactly *when* this should be done is already known, but exactly *how* much is quite another thing, and depends largely upon the conditions of the atmosphere outside. The point is this: the humidity inside the egg-chamber must be the same, whatever the conditions are outside. If your machine is in a warm, dry room, heated by a fire, far more evaporating surface will be required than in a cool, dry cellar, for the reason that water vaporizes just in proportion to its heat; and as the circulating pipes upon which the water-pans rest must necessarily be much warmer in a cold room than in a warm one. Of course more surface must be exposed in a warm than in a cold one.

The operator will always have to use his judgment more or less in that. It may perplex the novice somewhat, but it is easily understood when one becomes accustomed to it.

Figure 5 represents the egg at the end of the fifth day, the circle enlarged, shaded darker in color; the whole egg being slightly darker in hue.

Figure 6, at the end of the sixth day, shows still more plainly the germ undergoing a gradual change in the egg, enlarging and assuming a darker hue. The outline of the circle is now gradually acquiring the form of an ellipse, and in a

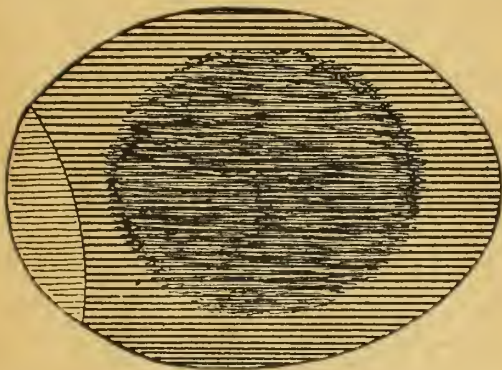


FIGURE 6.

live embryo the line of demarkation should be distinct. If it is at all wavy and irregular in its outline, and instead, remaining intact, the contents of this ellipse show a disposition to assimilate with the surrounding liquids when the egg is revolved, it can be safely removed as a dead duck.

Figure 7 represents a dead embryo, as it will appear from the seventh to the twelfth day. The germ being separated and appearing in dark irregular blotches over the entire surface of the egg; the egg having become nearly opaque over its entire surface. At this stage the egg, if it has not already become so, will soon be very offensive. These should be re-

moved at once and handled carefully the while, as they are apt to explode and unpleasant consequences ensue. The operator should run no risks, as discoloration on the outside shell of a duck egg is a sure sign of decay, and they can safely be taken from the machine. There are always a certain number of duck eggs (especially during the month of August and the latter part of July) that have the appearance of fertility during the first three or four days of the hatch, but do not possess vitality enough to carry them through. These die at all stages of the hatch; neither operator or machine is re-

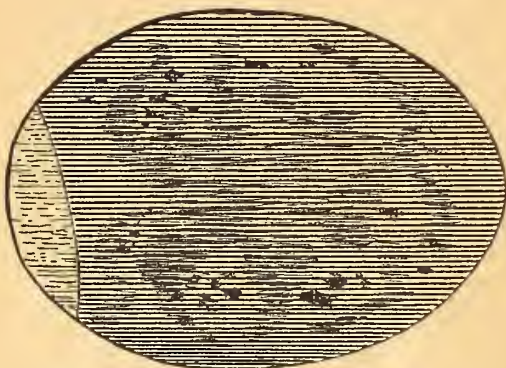


FIGURE 7.

sponsible for them. This is caused by the condition of the mother bird. In order to economize the room thus made by the removal of the infertile eggs, I run a small 150-egg machine, in connection with six of the largest size, using it, as it were, as a tender. When filling one of the large machines, I always fill one tray in the smaller one so that when the eggs in the large one are tested, after the third day, there will usually be eggs enough in the small tray to replace those removed as infertile, so that the large machines are kept full during the entire hatch by the little one. Thus the small machine is made to accomplish far more than it would

were it run through the hatch. I am thus enabled to have a hatch come off every four or five days, consequently our eggs are never older than the time when introduced into the machine. Always date each day's quota of eggs keep them by themselves, then there will be no mistakes made. I have known parties to keep one general receptacle for their eggs, and when filling their machine take them from the top, while the bottom ones were never disturbed, not even turned, and of course soon became worthless for any purpose.

Figure 8 denotes the appearance of the egg during the

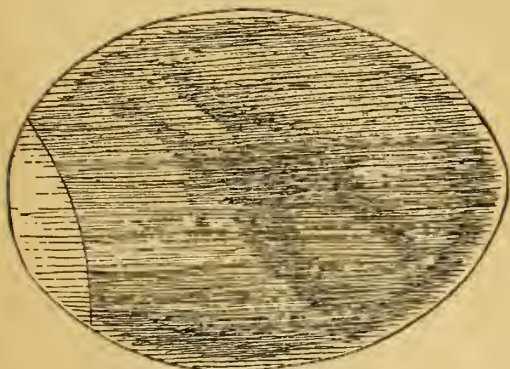


FIGURE 8.

eighth day of incubation. If portions of the shell are carefully removed at this stage, the rudimentary intestines may be plainly seen, together with the gradual development of the beak and eyes, as well as the trembling of the pulsating arteries through the whole embryo. At this stage the operator should mark all doubtful eggs and return them to the machine, as he will find plenty of room in his machine. He will soon become expert, and can detect life and death in the germ at a glance. Experience alone will give the operator an insight in this business. The incipient stages of decay, though easily detected by the expert, cannot be intelligently

described by him. The application of a little heat for the short space of twenty days to an inert mass, developing it into active, intelligent life, is simply wonderful. The process and effect he can easily describe, but the procreative power behind it all is beyond his ken. Should a little duckling be taken from the shell on the thirteenth or fourteenth day it will resemble *Figure 9*. It will kick and struggle several moments after its removal. The yolk is not yet absorbed, but the process is just beginning and will continue until the twenty-fourth day, when it will be nearly absorbed. The egg from the fourteenth day rapidly assumes a darker hue. The extremities of the little bird gradually develop, the feathers grow, and at the twentieth day the egg is opaque. At this stage the embryo will endure greater extremes of heat or cold than at the



FIGURE 9.

earlier stages of the hatch. I should not advise the operator to presume upon this, however, but just make the conditions as favorable as he can, so that the little bird will have the strength to free himself from the shell. I need not say that this is the most critical time during the whole process, and matters should be made as favorable for the little duckling as possible. About the twenty-fourth day he will be all ready to break the shell, but, unlike the chick, who will make his way out of the shell a few hours after he has pipped, the duckling will lay for forty-eight hours before he is ready to come out. At this time there should be plenty of moisture in the egg-chamber, for should the orifice or broken parts become dry, and the little duckling, in consequence, be attached to the inside lining so that he cannot turn, he can never get out with-

out help. When the hatch is well underway a little more air should be allowed to circulate in the egg-chamber, and a part of the evaporating surface can be removed, for as each duckling makes its appearance he becomes a little sponge, until dried off, and furnishes plenty of moisture for the machine. When nearly dried off the duckling should be dropped into the nursery below the egg-trays. While hatching, the eggs should be kept pipped side up in the trays, as they sometimes get smothered when the orifice is underneath. The dry birds should be dropped below about once in four hours, for, if

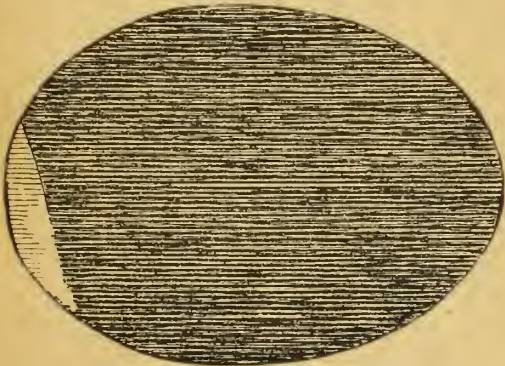


FIGURE 10.

allowed to accumulate, they will roll the eggs upside down, crowd the egg-shells over the pipped eggs, or pile themselves over the eggs, smothering the young birds. This work should be done very quickly, so as not to derange the temperature of the machine. Be sure to keep the heat up in your machine, for its tendency is always to go down during hatching, for the reason that the egg radiates a great deal of heat, while the little duckling, with its wooly covering (which is a non-conductor), retains it. Many people advocate allowing the little fledglings to remain with the eggs until all are hatched, but this is all wrong, not only for the above reasons, but for one

which is far more important than either. The amount of heat requisite to hatch the egg is too much for the young birds already hatched and dried off. With chamber at 102° , they will be seen crowding around the sides of the machine with their little bills wide open, gasping for breath, when, had they been placed below, the proper temperature can be maintained in both, as the bottom of machine runs at least five degrees lower than the egg-trays.

Now the egg of a duck, or a white egg of any description, can be easily tested at from 48 to 60 hours after being placed in machine, as the germ can then be readily detected at that time, but a brown egg should be left to the fifth or sixth day, or perhaps the eighth or ninth by an amateur, when as he becomes expert the time can be reduced. Of course, as the germ of fertility is the germ of decay in an egg, white eggs tested out of machine on the third day are just as good for all culinary purposes as fresh fertile eggs, even better. To illustrate this I will say that our dealer in Boston to whom we consign hundreds of dozens of infertile eggs every season, allows us five cents per dozen more than he does any one else, because, said he, "I never have had a poor egg from you and I can always recommend them, and when I get eggs from other parties I very often find stale ones among them." He really seemed to think that the farmers imposed upon him with stale eggs when the real facts were that the farmers were not to blame at all, as ducks eggs begin to incubate at 85° of heat, and during the extreme heat of summer all fertile eggs soon become stale and discolored. Not so with the infertile eggs; they may evaporate in time but never become stale. I have kept eggs for a whole year and found them perfectly sweet at the end of the year. As an experiment I once kept infertile eggs nine weeks in an incubator subjected to a temperature of 103° . At the end of that time the contents evaporated to less than one-half of their original bulk, in fact perfectly solidified, and yet when broken and tested apparently just as sweet as when first put in machine.

BUYING EGGS FOR INCUBATION.

Many of the large poultry growers in our state and vicinity buy all the eggs they use in their machines from their neighbors, paying them a few cents extra per dozen for choice eggs, the understanding being that none but the most vigorous cocks must be used with a proper complement of hens in each yard ; that the eggs, during cold weather, be collected several times a day and kept in a uniform temperature, on end, and that the purchasers have the privilege of rejecting all rough shelled, misshapen and defective eggs. The plea for this course is that to grow their own eggs necessitates more territory, more buildings, more care and a much larger amount of capital, neither of which they possess. That this is a mistake on their part does not admit of a doubt. One reason is that persons can always grow their own eggs a great deal cheaper than they can buy them. Another, which is of far more importance still, is that he is in a situation not only to control the fertility of his eggs, but the health of his chicks as well ; the latter he can hardly afford to ignore. It is a poor business, however, that with careful management will not sooner or later furnish capital to meet all necessary contingencies, and a well adjusted poultry ranch that does not clear one hundred per cent yearly on all capital invested in the shape of buildings, machinery, grain, etc., can hardly be said to be well managed.

HOW TO FERTILIZE EGGS.

There is no secret in the fact that good healthy poultry can be made to lay just as many eggs during confinement in either winter or summer as under similar conditions when running at large. The greatest trouble he will have to contend with will be to make these eggs fertile, and he must understand that in order to do this he must completely reverse nature. It is in the dead of winter when he wants and must have his eggs : at a season of the year when all nature, all animal and vegetable life is at rest ; when the trees are leafless and the ground covered with ice and snow, and even the elements themselves are against him ; *he must reproduce if he would succeed.* It is

in the glad springtime when nature, in response to her Maker's call, clothes herself with green ; when all insect and animal life as well, go forth to increase and multiply. The poulterer must, during the cold winter's blast, make the conditions as near springlike as he can. His buildings must be warm and clean ; the air pure and sweet ; his feed generous and of a suitable kind ; his care and supervision constant and ceaseless. Under these conditions his fowls will be under complete control and can no more help contributing a liberal supply of good, strong fertile eggs, than can perfected machinery help turning out the finished article where a plentiful supply of raw material is turned in. I would emphasize the above, as the effect of neglect will soon become apparent. Disease will be more frequent in winter—vermin in summer ; both must be anticipated. I can truly say that I have not had a case of gapes, roup or cholera, or even vermin, in any of my poultry houses for years. It is easy for the expert to determine when things are not just right with his fowls : the slightly languid movements, pale wattles and comb, lusterless plumage, precarious appetite, discolored excrements, are all sure premonitions of what is to come and reminds him too well of some duty neglected. In order to be sure of good, strong fertile eggs, I get out my pullets early in the spring so they will commence to lay in September, so that by the time I want my eggs for incubating purposes they will have laid several dozens of eggs each. The birds will be matured and the eggs of good size. These birds are crowded for all they are worth and are kept laying the entire winter until eggs become cheap in the early summer, when they are dressed for market. It is not policy to get out store pullets too early so that they will commence laying in August, as they will be sure to moult in November and be barren just when you want your eggs most. It is the same with old hens ; they will moult and be off duty for three months in the early winter ; that is one great reason why eggs command such prices at that time ; too many people keep their old hens over and they are all off duty at the same time, and when they resume laying eggs come down with a dump. Asiatics should never be kept more than one year

after being forced the preceding winter, as they become plethoric and fat and do not lay eggs to make their keeping profitable. It will do to keep Leghorns and some of the smaller breeds over the second year, as their fecundity holds out longer than the larger breeds, while mortality among them as old fowls is much less. But these breeds are not to be thought of in connection with market poultry, unless crossed with some of the larger breeds.

HOW TO KEEP EGGS.

The eggs should be gathered carefully several times each day, during cold weather, and placed small end down in a room with an even temperature running anywhere from 35 to 50°. They will keep with these conditions for three weeks, so that a person having but one incubator and a small number of fowls can easily keep his eggs from one hatch to another without injury. A common thirty dozen shipping case is the best and cheapest thing for this purpose. I use them exclusively, buying second hand ones of the commission dealers at ten cents each, and we find them not only good to keep eggs in, but convenient for short distance shipping cases when eggs are wanted in quantity for incubating purposes. When I say that eggs will suffer no injury at three weeks old when kept in this way, I do not mean that I should not prefer mine fresher. Indeed, eggs shipped long distances during the extreme heat of summer will not keep three weeks for this reason. I never fill an order with eggs that are more than four days old, and long distances, the day they are laid, if possible—all old eggs being consigned to my own machines; but this has been unnecessary with us, as there has seldom been a time during the past season when the egg product of one day would not fill a six-hundred-egg machine. Your incubator should be carefully regulated before introducing your eggs. It will be several hours before they reach their normal heat, which, as has been before stated, should be as near 102° as possible, a slight variation being of little account.

GOOD THERMOMETERS NECESSARY.

If fortunate enough to secure a good machine, the next thing

is to procure accurate thermometers. Good glasses are usually sent out with each machine and it is for the manufacturers' interest to see that they are accurate. In years past much of the trouble arising from the use of incubators could be traced directly to the use of defective glasses. This has all changed now, the general use of incubators has brought thermometer manufacturers to their senses. These people, any of them, would use new tubes, which would invariably shrink in the course of time, destroying the accuracy of the glass. Twenty years ago makers all seemed to have a base or standard of their own, and though they were all registered alike, were gauged from one to four degrees apart. The first glasses I used I was obliged to run my machine at 106° in order to secure good results. I remonstrated with the manufacturer but could get no satisfaction, as he said his glasses were all based upon freezing point. I have a box of those glasses now and though they register all alike are gauged exactly four degrees to high. I order my glasses made to suit, under the guarantee that they shall not only be based upon government standard, but must register within one-quarter of a degree, and as we handle many gross of glasses each season, it is for the interest of our makers to get out a first-class article. If all incubator manufacturers should exact the same guarantee, it would go far toward fixing the reputation of their machines. I would say here in the case of indifferent hatching, before blaming either eggs, operator or machine, be absolutely certain that your glasses are right. Do not be satisfied with placing them side by side in an incubator, *that* is no test at all. A sure way to test your glass is to place it side by side with one that you know is accurate, in water at 103° degrees, stirring the water carefully; this will give you the exact gauge of your glass.

TURNING EGGS.

After the first twenty-four hours turn your eggs twice a day till your chicks begin to pip; be sure and do this, as it is absolutely necessary to secure a good hatch. It is well to do this at regular periods, you will not be so apt to forget it. There are many who will tell you that turning your eggs once

a day is all sufficient, and others that every other day will ensure you just as good a hatch. These are extremists and are entitled to no credence. We had a neighbor a few years ago who, having got up a machine of his own and who turned his eggs once in two days, reported that he got better hatches by that course. We always noticed that very few chicks graced his yards. He laid it to defective eggs which he procured from his neighbors, but as those neighbors got first-class hatches from the same eggs, every one had their own opinion as to its cause. More than twenty years ago, after a long argument with a scientist on this subject, I tried my first experiment with a view to satisfy myself as well as throw as much light as possible on the subject. He undertook to say that turning the eggs was not only wholly unnecessary, but an absolute injury to the eggs, and that the little germ should be kept as still as possible during its development, and that the only reason so many hens did such poor work was because they were so uneasy, disturbing their eggs so much during the hatch. From a lot of eggs all carefully mixed and from the same yards, I placed one-third of them in a machine on end, with the large end upward, another third in the same machine in a natural position on their side; both lots so firmly fixed that they could not stir. Neither of these lots were moved during the entire three weeks. The third lot was laid beside the other on their broad side and turned carefully twice each day. The result was forty-seven per cent of those standing on end, fifty-four per cent of those in their natural position, unturned, and ninety-six per cent of those that were carefully turned. In regard to the still eggs it was plainly a case where the fittest survived. An examination of those eggs showed that the germs had died in all stages of development and many on the nineteenth day just before hatching, while in many cases the yolk had settled down through the white of the eggs and attached itself to the shell effectually preventing the egress of the chick. I have tried this experiment many times, the results always being in favor of the turned eggs. The past season I filled a large machine with four trays of eggs; those trays were all carefully labeled, the conditions made the same for

all. No. 1 tray was not turned at all. No. 2 was turned every alternate day. No. 3 once each day, while No. 4 was turned twice each day. I got more chicks from the latter than from all the other three combined. Now, when a man has tried experiments of that kind often enough and always with the same result, the thing has become a settled fact in his mind, and all the arguments to the contrary ever adduced will never convince him he is wrong.

MOISTURE.

With machine filled with eggs and quietly running, with good thermometers, the next point of interest is that of moisture. This has been a mooted question for years, not only among different incubator makers, but among those who use them in all parts of the country; some stoutly maintaining that moisture in the egg-chamber of an incubator, outside of that which nature produces, is wholly unnecessary, while others are equally as confident that excessive moisture produces with them the best results.

These people may be considered extremists, though their location may in some measure justify their arguments. It is a very difficult thing for the maker of an incubator, even if he is an expert himself, to give out correct rules for vaporizing his egg-chambers, because, this must depend largely upon the locality of the purchaser and where the machine is placed. It makes a vast difference whether a machine is run in a moist cellar or in a dry room overhead, in a humid atmosphere near the seashore, or in a rarified atmosphere at an altitude back in the country.

It is plain that the same instructions would not suffice for these different localities and conditions, and that a small part of it at least must be left to the judgment of the operator himself. I have used different makes of hygrometers during the past twenty years, with a view to ascertain the amount of moisture that will give the best results, but with indifferent success, partly from the foregoing reasons and partly from defects in the construction.

After a long series of experiments, I am fully convinced

that a moderately vaporized egg-chamber will, in my latitude give me better hatches than a dry one. I will give the results of some of these experiments in detail and leave the reader to draw his own conclusions.

It must be remembered that in machines where there is constant ventilation, more moisture must be generated than where there is none. I first resorted to spraying the eggs as a means of securing the necessary amount of humidity, but soon found that was not to be thought of; first, because vaporization was then simply periodical, not constant; again, the excessive evaporation caused by profusely spraying the eggs, reduced the heat to such a degree as at certain stages of development to be absolutely injurious to the young germ, the glass often going down to 70 or 80 degrees, when it would be several hours before the eggs would resume their normal heat, bringing the hatch out sometimes one or two days behind and not always in first-class condition; so that I would not advise any one to spray his eggs, unless by accident or carelessness the heat became excessive, when that would be the quickest and surest way to reduce it.

Public opinion has changed very much on this moisture question within the last fifteen years. During the carbonic-acid-gas era, when excessive ventilation was the order of the day, there was no fear of getting too much moisture under those conditions. In fact, I had great faith in moisture myself about that date and hardly thought it possible to get too much; so, as an experiment with a view to testing the point, I filled a 60-egg machine with eggs, at the same time covering the entire bottom of machine with evaporating pans from the first; water was constantly running down the glass doors in front and the metallic sides of the machine during the entire hatch. The eggs were unusually fertile, and I noticed with great satisfaction that animal heat started in good time and increased rapidly as the chicks developed, and I anticipated a first-class hatch.

The chicks began to pip on time and things promised fairly well, but after a time I noticed that many of the chicks that first pipped, for some reason, failed to come out, while many

of the eggs that I knew had strong live chicks in them, failed to pip. On investigation I found that in nearly all the pipped eggs, that the little bill was forced out far beyond the shell and that the pressure was so great that the little fellow could not draw it back, in order to free himself from the shell; in fact, the pressure was so great that the flesh was fairly forced out beyond the shell. It did not take me long to see that I had got to help these chicks out or lose them. I found as I began that there was little or no vacuum in the eggs and that some of the little bird's heads were even flattened by the pressure. I then began upon the whole eggs, giving the chicks air and letting them out by degrees. I got, under the circumstances, a most remarkable hatch, for not only were the chicks lively and healthy, but in two of the trays every egg hatched but four, and those had dead chicks in them; the whole machine turning out a ninety-four per cent hatch.

This experiment satisfied me of two things; first, that though excessive moisture was not injurious to the health of the chicks, it was decidedly so to the percentage of hatch, as I should not have got out sixty per cent had I not helped them out with so much care. I was as much in the dark as ever and no nearer the solution of the difficulty, except that excessive moisture was dangerous.

The question then arose, is any moisture necessary in an egg-chamber? I knew now that it was absolutely necessary that eggs should evaporate to a certain extent, and that there must be a vacuum in the large end of the egg of nearly one-fifth of its capacity, in order to make room for rapidly increasing development and enlargement of the chick from the fifteenth to the nineteenth days; but just how much was the point to learn.

That a moderate degree of moisture was not harmful but beneficial, I well knew, because for years I had invariably obtained first-class hatches from my machines, and at some seasons of the year better than from my best hens; and I had always used a liberal supply of moisture. With a view to settle all doubts on the subject, I filled a small machine with eggs, using no moisture from beginning to end of hatch.

My eggs were unusually fertile that season and the germs strong, and it was a favorable opportunity to experiment.

This machine was run in the same room with my large machines and with eggs from the same yards. It was given the same care. The result was about eighty per cent of strong healthy chicks, while the other machines had been giving me from ninety-one to ninety-six per cent on the average. The remaining eggs were all broken and carefully examined; I found that the majority of those eggs were either inclosed with thin shells or that the shells were very porous on the large end; all much evaporated. There were chicks in nearly all the eggs, mostly dead; the live ones so reduced in size as to be worthless. I am perfectly satisfied that a fair degree of vaporization in that egg-chamber would have given me a twelve to fifteen per cent better hatch.

A question arose about this time whether I could not coat the egg shells with some air-excluding compound and thus ensure better results. A number of eggs were coated with shellac, excepting quite a space on the large end, and run through a machine without moisture, with fair results. A second time this was tried and a fair hatch obtained, though neither of these hatches were equal to those secured from the vaporized egg-chamber. A third time the surface of the eggs were covered, excepting a very small space on the upper end; this hatch proved nearly a failure. I gave the thing up in disgust, thinking it too dangerous to tamper with.

One thing especially discouraged me and that was, that to all the chicks that expected to come out at the small end of the eggs it was sure death, and as quite a number of my young birds, both chicks and ducks, made their appearance at that end, and I could not determine this point at the time the painting was done, it made a dangerous experiment of it.

EVAPORATION.

I had often examined the natural evaporation of eggs as set under hens, and compared them with those taken from the egg chamber of an incubator, both vaporized and dry, thus comparing the evaporated space in both. Doubtless many of

my readers have done the same thing, but this was a very uncertain and incomplete way of getting at a solution ; it was simply guess-work and wholly unsatisfactory, and I resolved I would know just how much the old hen evaporated her eggs and just how much they were evaporated in a dry egg-chamber.

A quantity of egg were collected, all were carefully inspected, and only those with a perfect shell were retained for the experiment. A part of the eggs were carefully weighed in an accurate balance and placed under hens. The rest were weighed on the same scales and placed in the dry egg-chamber of an incubator ; both were tended with the greatest care. Every fourth day those eggs, from both machine and hens, were carefully weighed on the same scales and at the same time, and the loss from evaporation strictly noted. On the fourth day the shrinkage was just 2.5 per cent on both machine and hens eggs ; on the eighth day 6.5 per cent ; on the twelfth day 9 per cent, while the nineteenth day gave a shrinkage of $13\frac{1}{2}$ per cent ; and strange to say the shrinkage was precisely the same on both hens and machine eggs through the entire hatch.

I was very much surprised at this, as I expected that the machine eggs would certainly shrink the most during the last part of the hatch. But the strangest part of it all was, the hens came out some 20 per cent ahead in the hatching ; as the discrepancy with me has usually been the other way, especially during the winter months when fowls are more or less confined and the egg shells more porous and imperfect. My machines always did from fifteen to twenty-five per cent better hatching than hens, and I am positively certain that had I vaporized that egg-chamber properly, biddy would not have come out ahead.

I broke and examined the unhatched eggs in both lots to see if I could detect any reason why one should hatch better than the other. I found but one thing that would throw any light on it.

There was a large concave place on one side of contents of the machine eggs—the inside lining being strongly attached

to the shell all around ; indeed, so firm was the adhesion in every case, that I found it nearly impossible to detach the lining from shell without tearing it. The chicks in these eggs had developed to the eighteenth or nineteenth day. Most of these chicks were dead, though a few were just alive, but with no possibility of ever freeing themselves from the shell, and even with assistance could not have lived, so imperfectly were they developed.

The shells of all these eggs were more or less porous on the large end, but strange to say this phenomena did not occur with the unhatched eggs from under the hen. There was but one chick dead in the shell ; it was fully developed, but for some reason was unable to free itself from the shell—and in all those cases there was little or no concavity in contents, and in no instance was there any firm adherence of the lining.

Now, there is but one way to account for this, and that is that the oily secretion from the feathers of the hen so far filled the pores and penetrated the shell of the egg as to prevent the firm adhesion of the lining, as well as the contracted and shrivelled appearance it invariably presented.

On the whole, I was somewhat disappointed in this experiment, for I started in to have the dry egg-chamber evaporate its eggs a great deal more than the old hen, and while it did evaporate those eggs with slightly porous ends more, those with sound, perfect shells, which hatch good, strong chicks did not evaporate quite as much.

Two things I learned from these experiments : First, that excessive moisture in an egg-chamber will not injure the health or impair the development of the young chick, providing it can get out. Second, that a moderately vaporized egg-chamber will always give me a little better hatch than a dry one.

The latter experiment has been tried so many times during the last ten years, with always the same result, that, in my latitude and with my machines, I can certainly speak with confidence.

COOLING EGGS.

The next question of importance to discuss, in artificial in-

cubation, is the cooling of the eggs daily down to a temperature of 70 or 80 degrees. I am glad to say that the advocates of this theory are becoming numerically less as the years go on, but it still has some tenacious adherents. The only reason the most of them give is that the old hen cools her eggs off every day and therefore it must be a necessity. They seem to forget that, though it may be a necessity for the old hen, it may not be at all so for the welfare of the embryo chick.

There is a scientific reason in favor of this practice, tenaciously held by some, which seems more feasible, but as repeated experiments have proved it at fault it is hardly worthy of credence. The theory is this : that air is very elastic in its nature ; that it is very susceptible to heat ; in fact has twelve to fourteen times the expansive properties of water. Now, it is claimed that when the eggs are taken out of the machine and cooled, that the air which fills the vacuum rapidly contracts, and, as nature abhors a vacuum, the pressure from without forces fresh air from outside into the air cell through the pores of the shell, and when the eggs are returned to the machine the rapid expansion of the air in the cell to three or four times its own bulk, by the increasing heat, forces out the fetid air from the cell, and this is what deluges the egg-chamber with deadly carbonic acid gas and gives the young chick the fresh air it needs for healthy development. It is claimed that the oxygen or life-giving properties of the air must come into immediate contact with the blood, in order to insure life and health.

To the argument that the air does not come in contact with the fetus in the womb and that respiration does not begin until after birth, the reply is made, that the mother breathes for her offspring and that pure, fresh blood is introduced through the umbilical cord, and that respiration is not necessary until after birth, when that cord is severed, and that in these different ways nature provides for her own contingencies.

But, unfortunately for the theory, plausible as it may seem, the facts do not bear out the argument, but show that this air-pumping process, and the method pursued to secure it, are not only not a necessity, but an absolute injury ; for I do not

believe it possible to obtain a first-class hatch when cooling off the eggs as above described.

There are many wholesale poultry growers who are using incubators on a large scale, who can testify to the truth of this.

I became convinced of this more than twenty years ago, and as my sad experience of nearly two years then, may tend to convince others of its truth, I will briefly relate it. At that time I had bought an incubator of some 500 eggs capacity, and among the instructions, which were anything but lucid, was: "Be sure and cool off your eggs fifteen minutes each day." Of course, this was a very uncertain process, as part of the time the thermometer was below freezing point where the machine was located, while during the summer months it registered 90° occasionally. In the one case the eggs were cooled down to 70 or 80 degrees, while in the other they hardly cooled perceptibly.

Under this treatment, my chicks invariably came out behind time, even to the twenty-second and twenty-third days. These chicks came out weak and many of them apparently in all stages of development, exhibiting every conceivable deformity.

I had repeatedly put glasses under hens to ascertain the temperature, which I found about 103°, and then run the machine the same. But I found that when the 500 eggs were taken out of the incubator and cooled off in a cold room for fifteen minutes and then were returned to the machine, there was such a large body of them that they seemed to cool the air in the machine, instead of the air warming the eggs; so much so that, when the room was cold, it was often three and even four hours before the eggs again reached their normal heat. Thus, in reality, I had been running at a temperature of from 75° to 103°.

How had biddy been running? I would find out about that. A hen was taken off the nest for fifteen minutes and then returned; when finally settled down a glass was carefully placed under her. In twenty minutes those eggs, brought into immediate contact with the rapidly-pulsating arteries of the hen's body, were back to their normal heat of 103°.

Here was a solution of the difficulty, and yet my instructions

were imperative to cool the eggs fifteen minutes each day. But I found that cooling the eggs fifteen minutes at a temperature of 4° did as much execution as cooling them fifty minutes with a room at a temperature of 80° .

Evidently things were mixed at headquarters. My eggs were unusually fertile that season ; of those consigned to hens fully 90 per cent hatched good, strong, healthy chicks, while I got less than 30 per cent from the machine, nearly all of which were a dead loss, on account of the weak and debilitated constitutions consequent upon their unfavorable introduction into the world.

I learned one important point thus early, which I never have forgotten, and that is, that the constitution of the chick can be easily ruined before it ever sees the light of day.

I was finally convinced that cooling the eggs was the main source of my trouble and resolved to run an experimental machine and decide the matter once for all.

I had long ere this cut myself loose from the inventor of my machine, as I found that his ideas of artificial incubation were of the crudest kind, and if I was to make any further progress in that direction, it must be through my own researches.

I procured three shallow paper boxes, perforated the bottoms, put twelve perfect eggs in each and placed them in the center of the machine. Box No. 1 was taken out and cooled fifteen minutes each day; No. 2 was cooled a moment simply while trimming the lamps; while No. 3 was not taken out during the entire hatch—the eggs being turned in the machine. From box No. 1, I obtained six chicks, the other six eggs having dead chicks in different stages of development; these chicks were out twenty-four hours behind time; box No. 2 hatched ten chicks, with two dead in the shell, just a little behind time, while box No. 3 brought out eleven strong, lively chicks, the twelfth egg being unfertile. The result of this experiment fully confirmed my experience of the two previous years.

It will be observed that I hatched fifty per cent of the eggs in No. 1 box. This was better than I was ever able to do before by the cooling-off process. The reason is obvious: when

a whole machine of cold eggs were returned to the egg-chamber, they cooled all the air in the machine, and as nothing but air came in contact with them, it was several hours before they recovered their normal heat; but when only a dozen were cooled, there were not enough to affect the egg-chamber perceptibly and they soon recovered heat. The moral of the whole thing is not that the change of one or two degrees is injurious (for during the last two or three days of the hatch it is a decided benefit) but that it is not necessary to reduce the heat of the eggs 15 or 20 degrees in order to cool the egg-cell, as everyone knows who has handled eggs during incubation that the air-cell cools almost instantaneously and that the change of air required takes place at once. This is one reason why I have always refused to introduce automatic turning trays into our Monarch Incubator, for I firmly believe that notwithstanding its large roomy egg-chamber that the slight exposure of the eggs to the air, especially during the last few days of the hatch, is of great advantage and will materially increase the percentage of the hatch.

I have always noticed that eggs were more susceptible to thermal changes from the third to seventh days, and that after the fifteenth day they will endure more of heat or cold than at any previous time, yet it is a good rule for the operator to allow his machine as little latitude as possible. The tendency of all machines is to run a trifle higher after the animal heat rises in the eggs and this is as nature would have it, as the heat always rises under a hen and when the eggs are strong and fertile the thermometer will always register 104° under a hen just before hatching and while the eggs are piped. I have known it to reach 105° and in one instance, while a hen was hatching young ducks, it reached 106°. Every egg of the thirteen hatched; one-half of them were already out, and it was a squirming, steaming mass.

TREATMENT WHILE HATCHING.

The thermometer may register 103° safely just before and during the hatch and the chicks will come out all the better. Of course, the amount of heat a chick or a piped egg will en-

dure depends largely upon the amount of fresh air it has. Given a good circulation of air and it will take a deal more to kill or even injure him than the novice would think.

Many advocate closing up a machine entirely while hatching, claiming that contact with the air, especially if it is at lower temperature than that in the egg-chamber, is injurious and often fatal to many of the chicks. That this is a great error there can be no doubt, and I think the reader will be convinced of it himself should he use a little common sense.

It is wholly contrary to my own experience, a little of which I will proceed to give, when each can draw his own conclusions. Every one must acknowledge that while the chick is pipping and freeing himself from the shell, it is the most critical period of incubation, and that the more fresh air he has to assist him, providing it is of the right temperature and humidity, the better are his chances for life.

In an egg-chamber where hundreds of chicks are out and more coming, when the air is fetid and foul and the chicks struggling for life, their chances are very much reduced. During the wild scramble of his elder brothers—who came out before him—clambering over him, excluding what little air there is and occasionally crowding an egg shell over the little orifice which he has made, means sure death, and in the end quite a reduction in the percentage of hatch.

My plan has always been to remove egg shells from the hatching trays and drop chicks into the nursery below every six hours, giving the chicks that are to come a much better chance of their lives.

It has been my habit, during the past ten years, to exhibit machines in operation at the fairs and poultry exhibitions from one to five hundred miles distant from my home. In order to this, the eggs are taken from the machine the day before hatching, placed in the trunks and transported by rail to the exhibition.

Now, where large numbers of eggs with live chicks in them are confined together, the animal heat rises incredibly; they had to be taken out of the trunk at least every thirty minutes and spread on the car bottom on a cloth, to cool off, or the heat

would soon have been so great as to kill the chicks. Sometimes these eggs begin to pip before they are taken from the hatchery and during transportation, while the heat is so great, numbers of them break the shell.

Once in particular, when transporting the eggs a distance of four hundred miles, the cars did not make close connections and the eggs were confined in the trunk between one and two days. Of course, as the time expired, the eggs not only pipped in large numbers, but the little ducks and chicks were bound to come out. I was kept busy all night placing those eggs around in the car seats, cooling them off. To crown all, the conductor reported the whole thing—that there was an old farmer in the forward car, hatching chickens and ducks out—in a trunk. As a natural consequence, the rear cars emptied themselves into that forward car in a very short space and we had a circus there all night long.

Now, every one must allow that the conditions were against me—yet out of those 400 eggs I got 384 lively young ducks and chicks. Now the question comes up, how much did the incessant exposure to dry and cold air impair the hatching of those eggs?

I can only say, that when one has passed through ten years of this experience and yet so often hears the refrain—"Don't open your machine and admit the dry air, or you will kill your chicks"—it is very apt to make him smile; as no one can say that I ever got a poor hatch at any of those exhibitions. So much for excluding eggs from the air.

WHERE TO PLACE THERMOMETER.

There is one point of interest which should have been mentioned before, and that is, where a thermometer should be located in the egg-chamber. Now this, in my mind, is a question of great importance, and one in which there is great difference of opinion. Some will tell you to hang your thermometer an inch above the eggs, so it will not get soiled while chicks are coming out; others, to lay it down among the eggs; others still, to place it on the eggs, and, after the fourteenth day, on a fertile egg.

There is no doubt but what the latter method is the right one. It is immaterial where the glass is placed previous to the fourteenth day, but after that period, when circulation is strong in the eggs and the animal heat rises so rapidly, is the time when the greatest care should be used. The reason is obvious. Previous to the rise of animal heat, the heat of the egg-chamber controls that of the eggs. After that period, the heat of the eggs, in a measure, controls that of the egg-chamber. Especially is this the case from the sixteenth to the nineteenth days. For instance, if you place one glass on a live egg on the eighteenth day and hang another an inch and a half above it, you will find that the one on the egg will register from three to four degrees higher than the other.

The same trouble appears when glasses are placed side by side, the one on a dead egg, the other on a live egg, in the egg-chamber. Hence I am always careful to test out all worthless eggs previous to the rise of heat in the eggs.

A short time ago a man wrote me, saying that there was something the matter with his glasses—they were developing the strangest freaks—first one would be two or three degrees high and then the other; but when taken out of the machine and tested in water, they both registered alike; at the same time saying that hitherto the temperature had always been uniform and that during the first part of the hatch things worked admirably, but that now, during the seventeenth and eighteenth days, he was having trouble; at the same time adding, in his postscript, that as he had plenty of room in his machine, he had neglected to test his eggs and wishing to know if that would make any difference. Of course, I had to explain the matter to him.

One would suppose that a little thinking would have revealed the whole thing. But, kind reader, thinking and the exercise of a little common sense seem to be about the only luxuries that your amateur poulterer will not indulge in—all the other necessary attributes he possesses and practices in profusion.

After testing out dead eggs carefully, I place my glass on the eggs in the center of the machine—then I know how to run.

But to return to the chick; another reason why it is not policy to allow the chick to remain in the egg-chamber while the hatch is being finished—allowing that plenty of air is given—is that the degree of heat required to finish out the hatch in good shape is too great for the chicks already hatched out and dried off. Those who have attended poultry shows and seen glass machines in operation, have doubtless noticed this.

My attention has often been called to the condition of the chicks by ladies—"Oh! do look! your little chicks are smothering; their little bills are wide open and they are gasping for breath." "I am aware of that, madam; but those chicks are here on exhibition. The heat, though too great for these chicks, is just right for the unhatched eggs, and the comfort of one must be sacrificed for the well-being of the other." "But is this always the case when you are hatching?" "Oh no; when in an incubator room at home, we always drop our chicks down in the nursery, in the bottom of the machine, as fast as dried off, where the temperature is about 95 degrees—that is about right for their comfort. The chicks remain in the nursery, say 36 hours, until they are strong and hungry and manifest a strong desire to get out by piling up against the glass doors of the machine. They are then ready for the brooder and food."

Just, here, let me say, is where the greatest amount of care and discretion is required. It is the turning point in the whole business between failure and success. It is a comparatively easy thing to hatch out good, strong, healthy chicks by the thousands; but quite another to grow them to maturity in first-class shape. And as this is the most vital part of the whole business, I propose to dwell upon it in detail, and if I fail to make myself understood, it will not be through lack of effort on my part.

NOT THE FOOD.

I am in constant receipt of letters from all parts of the country, from people complaining of a sad mortality among their chicks. It is the same story with all—"My chicks are dying off at a fearful rate; they appear strong and healthy

when hatched, but soon have the diarrhœa, become pale and sickly, refuse to eat and then die off by the wholesale. I have fed all kinds of food, cooked and raw, hard grain and dough, (and sometimes many of the different compounds recommended by poultry growers,) but with no apparent change for the better; they will die in spite of all, and those that are left alive are a sorry-looking set and seem anxious to join their comrades who have gone on before—and I am almost discouraged. If you can do anything to enlighten me as to the cause of my trouble, please do so and you will confer a lasting favor."

These letters are nearly all of the same import—their chicks have the diarrhœa, die off; they change their food, giving them different rations every day. Now, I heartily sympathize with these people for I passed through the same sad experience myself, more than 30 years ago, and as I look back, often wonder how it was I was so blind and why I did not exercise a little common sense. But, sympathize with these people as I may, it is impossible to answer all their letters in detail, and almost equally impossible to convince them that the food they give their chicks has little or nothing to do with their trouble—that chicks will live and grow on almost any kind of food or grain, but of course will thrive better on that which is best adapted to their age and wants.

The rules and regulations are few and simple, and all that one needs is to thoroughly understand the wants and habits of the little birds to be enabled to grow them successfully. Now, the main source of all this trouble is *too much heat*, coupled with *too little air* and *exercise*. The little birds are literally roasted and smothered to death. Your amateur chicken grower is bound to treat his chicks like exotics and tries to train them as he would hot-house plants. He carefully regulates his brooder to 90 degrees and puts in its complement of chicks, the animal heat of which promptly raises the heat to 100 or 105 degrees. The little chicks, feeling uncomfortable, begin to crowd, as they always will under such circumstances—in fact, they will often crowd themselves into a knot when there is no occasion for it, at all; it seems to

be a natural tendency or inherent disposition on their part, that *must* be prevented, or fatal consequences will surely follow. When a brood of chicks are packed together in a solid mass—as they only know how to pack themselves—at a temperature of 100, the inside ones are in rather a bad position; but there is no backing out of it; they *must* stand it through the entire night, and if, fortunately, they are not trodden under foot, they come out in the morning with anything but a good appetite—their vitality completely sapped. The next night, the outside ones get inside and take their turn at the mill, and before the end of a week those chicks—the greater part of them—are beyond help. In the mean time the operator, noting that something is wrong, is busy changing his feed, always giving them three times as much as they can eat allowing it to sour and mix with the excrement. He sees that something is wrong—finds his chicks crowd, and, thinking they are cold, applies more heat, and after he has made a complete holocaust of the whole, is in about as much perplexity and chagrin as a man can well be in—especially when he has many kind neighbors, who are so free with sympathy and advice, and some wise ones, who are secretly glad that their predictions are fulfilled.

Now, before a man will be thoroughly convinced of his error, he must understand its cause, and I will endeavor to show how naturally and easily the tyro is drawn into trouble.

In the first place he starts in with the impression that all the trouble he will have to contend with will be the hatching of his chicks—not in growing them. It is in vain for you to tell him that the laws and requirements of artificial incubation are now under almost absolute control and that careful observance of instructions and regulations, *will*, on good eggs, always insure him a first-class hatch, and that the main trouble he will have to contend with will be to grow them successfully after they are out. I will endeavor to follow the course usually pursued by one of these unfortunates, when it will be seen how naturally and inevitably he comes to grief. He has just secured a hatch from a 60-egg machine he has 400 or 500 strong, healthy chickens in

that machine, which is quietly running at 90 degrees with ventilators open. Those chicks are already for the brooder, which he has previously prepared for their reception; his thermometer is running at 90 degrees there, also. Now after that machine is emptied, if he would take the pains to look at his glass, he would find the temperature reduced to 60 or 65 degrees; or, in other words, for every fifteen chicks he took out of that machine he reduced the heat one degree. Now the same principle, that of animal heat, which reduced the temperature of his machine, would naturally increase that of the brooder, and the same glass, if introduced among his chickens, would reveal at least 100 degrees of heat (and if carefully fringed all round, as many of them are, to exclude the air and keep the chicks warm, 110 degrees.) Let me here say that we have done away with fringe; we have not used it in years, and don't want any one else to. Pure, warm air never injured any one yet, not even chickens, provided it was of the right temperature. This confining chicks in a closely fringed brooder, filled with fetid air generated through exhalations from both the lungs and their own excrements, if persisted in, can result in but one of two things either death or decrepitude in their worst forms, and yet these people will insist that the food is the trouble.

Some time ago a man, living several miles away, rode over here saying that he had a fine hatch of chicks out, five or six days old, but that large numbers of them were dying; that the morning before he had found twenty-three dead, and that morning forty-one; that there were about three hundred left, and he wished to save them if possible; that they had the diarrhoea badly, and nothing would do but that I must go home with him and prescribe for them. When I saw them, I found it was the old story. Said I, "You have overleated those chicks."

"Oh, no, it was just right, he had kept it 90 degrees right along."

When I placed my hand under the brooder, among the chicks, I was surprised to think that he had not lost more. I requested him to place a thermometer in his brooder among

his chicks, (this brooder, by the way, was bottom heat—a thing I abominate); he did so; we talked a while and when he took it out it registered just 115 degrees. Said I, “It is a pity I had to come so far to convince you of this. Now reduce your heat 25 or 30 degrees; boil a little milk and moisten some cracker crumbs with it and feed freely for a day or so and the diarrhœa will be all right.” But he was not convinced, for in a few days I received a letter from him telling me that his chicks were doing well; that the cracker and boiled milk had done the business and that he knew it was the feed all along. That was several years ago. I need not say that that man has gone out of the business, as he would persist in cooking his chicks before they were grown.

HOW TO FEED.

Aside from excessive heat, the great mistake of amateur poultry growers is not so much in the quality of the food as the quantity and the manner of feeding it. They will feed a large quantity at a time, perhaps three or four times what is needed, allow it to accumulate, sour, mix with dirt and the excrement of the chicks, and the little things, having no mother to teach them the difference between food and filth, too often eat both indiscriminately. Indeed, it is difficult for them to distinguish, being mixed together as they too often are. Of course chicks will not thrive under such treatment, and they will soon become debilitated, if persisted in. A young man living close by me, who had just got out a fine hatch of nearly 400 Light Brahma chicks, and whose chicks had reached a week old, with a loss of less than one per cent., came to me one morning, saying :

“Mr. R., there is something the matter with my chicks; I found quite a number dead this morning, and they seem to have lost their appetite.”

“Did you dissect any of them to ascertain the cause?”

“Yes, and I found their crops full of sand.”

“Not much nutrition in that. How did you feed?”

“Principally on oatmeal. I threw it among the sand, thinking it would give them exercise to scratch it out.”

"That is it, you mixed both together, and being nearly the same color your chicks ate both indiscriminately, and when there was no oatmeal present and, feeling hungry, they naturally substituted the sand. Now, go right home, replace that sand with barn chaff, make you a feeding board, and feed on that exclusively and feed no more than your chicks will eat clean."

He did so and met with no more loss, except a few through hawks and vermin. Before placing your chicks in the brooder, be sure and provide yourself with feeding boards—a board three feet long, and eight to ten inches wide will be all sufficient for seventy-five chicks. This board should have sides and ends, one-half inch high, made of laths or some thin material; this effectually prevents the chicks from scratching the food off the board into the dirt and filth, and also from mixing the dirt into the food. This board should be kept absolutely free from all sour food and filth. Granulated oatmeal should be kept on it constantly for the first two or three days, as the chicks do not always know where to find the food at first, but they soon learn from each other, and after that, will readily detect the attendant's step and will rush out eagerly after their food. But I do not confine myself to oatmeal alone, as it soon becomes too expensive. I use the same compound for starting off both ducklings and chicks. This food is composed of one part infertile egg, boiled hard and chopped fine, mixed with four or five parts ground cracker, or or hard bread moistened with either milk or water; the egg should be mixed in with the dry cracker as it will keep in that condition. enough, say, to last two or three days and should be moistened only as it is fed.

OVERFEEDING.

Many of our poultry growers denounce hard-boiled eggs as being decidedly injurious and wholly unfit to start young chicks, as, if persisted in, it will surely give them the diarrhoea, asserting that they have tried it to their satisfaction and always with the same result. The real fact of the matter is that they have fed too much of it; they will mix the egg

with other food and give the chicks so much of both that they will gorge themselves with the egg alone ; they will always do that, as they are usually very fond of it and, as it is conspicuous from its color, they can easily distinguish it. Of course this would have the same effect on the chicks as an exclusive diet of meat or any other animal food. I have always used this compound myself, and honestly think that when judiciously fed in the right proportions, it is the most natural and best food extant for starting off both chicks and ducks. I have fed it exclusively to whole machines full of chicks with the best results, and in some cases with a loss of less than one per cent. There is one thing which I wish to emphasize particularly *just here*, generous but careful feeding. The confirmed habit of over feeding which prevails everywhere, even among noted poulterers, men who observe the greatest care in feeding their horses, cattle and swine, giving them just what they will eat clean and no more, will deliberately feed their young chicks to repletion and keep large quantities of food by them continually, remaining by them often until it becomes sour, nauseous, and wholly unfit for food. It is a recognized fact that cattle and swine cannot be grown and fattened successfully by keeping an over supply of food before them and constantly glutting their appetites ; and yet these same men will completely reverse that principle when feeding their chicks. The great trouble seems to be that they cannot regulate the quantity ; they have, apparently, no idea what a small amount of food is required to feed even a large number of newly-hatched chicks ; that they should be fed every two hours, but that the amount necessary for each chick is almost infinitesimal in quantity. The injurious effect of over-feeding is seldom noticeable during the first few days of the chick's life, but after it is a week old it soon becomes apparent, when it gradually crops out in the shape of weak legs, pale faces, languid movements, ruffled feathers with a strong tendency to grow the wrong way. These symptoms are always more prevalent when chicks are confined during the extreme weather of winter with food lying by them constantly. There is no necessity or inducement for the chicks to exercise ; they simply lie around

eating at all times. There is soon a total want of action in their digestive organs, weak legs follow as a natural consequence, as the most active members of the body are always the first to suffer from disuse.

BEST HEATING SYSTEM.

Some of your readers have written me asking me to describe a good and economical heating system. Perhaps this would be as good a time as any. Of course every one understands that up to a certain extent the business can be done much more economically with good brooders. When beyond that, a good heater would be more economical, both in fuel and labor. When the operator does a business large enough to require the use of five or six brooders, it would be cheaper for him to put in a heater at once, as the original cost of the heater is less than that of the brooders. Years ago, when the question of heaters was first agitated, the cost was enormous and the consumption of coal in proportion. Large hothouse boilers were used, often at a cost of several hundred dollars, before the thing was ready for use. Now a good heating system can be arranged for a building one hundred feet long at an expense not exceeding \$80. This, of course, would be much less than a complement of brooders for the same building.

The heating system has several marked advantages over the brooders. One is that during the extreme cold of winter the building is always warm enough for the little birds, while with nothing but brooders it would often freeze around them, necessitating feeding inside the brooders, which would not be as healthy for the birds. Again, there would be a great saving of labor, as a self-regulating heater would require no more care than a single brooder, while the oil consumed in the brooder would fully equal the cost of coal required for the heater.

There is one point here which the beginner should always take into consideration in the selection of a heater, and that is, be sure and get one that will give you the greatest amount of heat for the fuel consumed. The patent steam and water heaters now upon the market are too numerous to mention.

But there is a vast difference in the economy of these heaters. When contemplating the purchase of a heater ten years ago, I called upon a party who was running one just purchased. He seemed very much pleased with it, said it ran admirably, warmed his buildings nicely, and only cost about \$1 per day for coal. I made up my mind then and there that I should run my brooders a while longer.

But on interrogating another party using one of a different pattern, he assured me that his heater warmed both brooders and buildings at a cost of 15 cents per day. This was presenting the matter in a new phase. The difference in cost of running these heaters one year would purchase two heaters. I procured one of the same pattern, and am now heating a building 135x15 feet at a cost not exceeding 15 cents per day. This is called "The Eastman Steam Heater," and can be run by either steam or water. I am sorry to say that this heater is no longer in the market, as the inventors have failed and gone out of business; but others have been invented since that that are just as economical and are giving good satisfaction. I will mention those that are in use in this vicinity—the "Walker & Pratt" heater and the "Bramhall & Deane" heater.

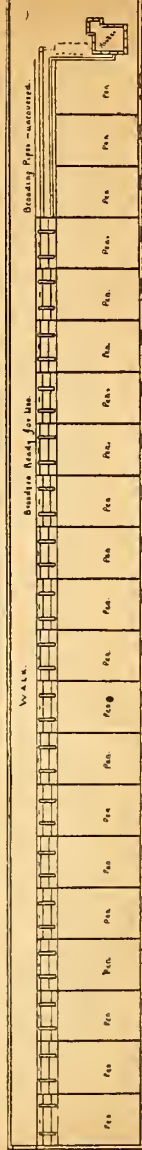
I prefer water for both safety and economy. For instance, should the fire go out accidentally the heat would cease at once where steam was used, while water would hold its heat for hours and would continue to circulate just so long as the water in the boiler was hotter than that in the pipes.

ARRANGEMENT OF BROODING HOUSE.

I will proceed to describe the interior arrangement for a brooding house. In the first place, as in the breeding house, there should be a walk three feet wide the entire length of the building on the back side. Next to the walk and parallel with it the brooder box should run. This box will be 30 inches wide, and, like the walk, the entire length of the building. In my building the brooding arrangement is very simple, being a box with two sides resting on the ground eight inches high in the clear, the ground being utilized as the bottom of brooder.



BROODING HOUSE.



PLAN OF BROODING HOUSE.

This brooding box consists of two parts. The sides, seven inches wide, are nailed securely, and constitute the sides of the pipe stand. The cover is portable, with cleats nailed across the top to strengthen it and with strips an inch wide nailed underneath, in front and in back, to keep it in position. These strips are supposed to rest on the 7-inch strips in the sides, and when the cover is on make a tight brooder. One cut represents the exterior and the other interior of the brooding house, with the covers on the brooders and ready for use. Also, with three of the covers removed, showing the heating pipes. These consist of a 2-inch flow and return running parallel with each other the entire length of the building and lying 10 inches apart from centre to centre. These pipes rest upon cross boards whose length corresponds with the width of the brooder and to which the sides are nailed. Two inch holes are cut out in the top of these boards into which the pipes are laid, the upper surface of which comes flush with the top of the boards so that when the cover of brooder is in position it rests equally on pipes and boards. The distance between these boards corresponds with the width of pens outside of brooder and constitute partitions for the same. The partitions are simply inch boards, 12 or 14 inches wide, fitting into ground in front of brooders to keep them upright and in position. The front of the brooders leading into the pens are cut out in centre of brooder four feet long and four inches deep to allow the free passage of the chicks or ducklings. These openings in the first four pens are fringed with woolen cloth cut up every four inches to keep the brooder warmer in cold weather. The remaining brooders are not fringed for reasons which will appear hereafter. The heater can be located in the end of the building most convenient to the operator. The bottom of the pens should consist of sand, which when it becomes wet and before it becomes offensive, should be covered with fine sawdust. This is a good absorbent and disinfectant as well. The inside of the four brooders next the heater should be filled up with sawdust to within four inches of the pipes, the distance being gradually increased as you near the other end of the building until the

whole eight inches in height will be required, using simply sawdust enough to disinfect the bottom of brooder. This is my present brooding arrangement, with the exception of a common door handle screwed on each brooder cover to facilitate handling. It may not suit everyone, some may want it more ornamental, more expensive; others may wish to simplify it still more. But such as it is, it is now all ready for use with heat applied.

For chicks the brooder should be divided into 3-foot spaces, about 50 chicks in each. For ducklings we divide it into 6-foot lengths and put in from 100 to 150, as ducklings do not crowd. So that for 50 chicks the pens would be 3x8 feet, and for 125 ducklings 6x8 feet.

We use fringe on the first two or three sections during the extreme weather in winter, and then only for a day or two. We do not grow ducks and chicks together in our brooding house. Somehow they do not fraternize. There are several reasons why. After the first two or three days, ducklings do not require as much heat as chicks, though I actually think they will endure more of either heat or cold. Their activity is incessant—indeed, it amounts to almost perpetual motion both night and day. The man who has been seeking perpetual motion for the past decade, I take it, never undertook to grow ducklings, or he would have found it exemplified in all its force. Again, they are very noisy, which seems to disturb the chicks in adjoining pens. They are far more filthy than chicks, and there is a constant odor peculiar to the duckling which affects the chick worst of all, so that in repeated trials, we have never been able to grow chicks and ducks together satisfactorily.

In using a brooding house with a heater, always keep the newly hatched birds next to the heater, for though the brooders would be no warmer at one end of the building than the other, yet the building would be warmer nearest the heater, as that radiates a great deal of heat. This surplus heat is just what is needed for the newly hatched birds, while it would be a positive injury to the older ones.

One need have no distrust of the heating system by the hot

water pipes, as it will work equally as satisfactorily as brooders, while beyond a certain extent, it is far more economical in labor and fuel, besides keeping a brooding house far warmer during extreme weather than it is possible to do with brooders. But to return to our chickens; but before doing so I wish again to emphasize this one point, *that it is far more difficult to raise chicks than to hatch them*, providing the eggs are good.

HARDER TO GROW CHICKS THAN TO HATCH THEM.

In conversation with all of our young beginners, there seems to be but one opinion on the matter, and that is, that they can grow their chicks easily enough if they can only hatch them out, and nowhere was this more fully exemplified than at the great New York Poultry Show. We did not see a man who distrusted his own capacity to grow chicks successfully if he could only hatch them out, while the distrust of incubators was almost universal. One man in particular, who wished to purchase a machine, said that he had a good place to grow his chicks in; it was an old-fashioned barn, with neither windows nor light, but with wide cracks between the perpendicular boards. He said he could easily cut in a window to give them light, and that the cracks would be no objection as the brooders would always be warm enough. Another proposed to fill his machine with eggs at once, and while they were hatching build his brooding house right upon the frozen ground and have it all ready by the time the chicks came out, when as the ground thawed inside the building and the mud became of the right consistency he expected to begin his experiment. Others still there were with just such crude ideas of the business and its management; but by far the great majority were confident of their ultimate success. Of course, in cases of this kind, there can be but one result—*utter failure*.

But the worst feature of the case is, very few of these men will be honest enough to acknowledge their own ignorance and want of experience as the primary cause of their failure, but will loudly denounce the whole thing as chimerical and

unnatural and say it cannot be done. Occasionally one will say that "they will have to learn a little more about the business before they begin again;" others, that "there is too much work and too close application in it for them." Now, I will say once for all, that there need be but little distrust of incubators. Nearly all of the first-class machines will hatch you out good chicks, with more or less care, but it is more than useless to introduce good strong chicks into the world only to have them killed through the ignorance of the operator or because no suitable arrangement has been made for growing them.

While an experienced hand can easily grow 100 chicks together with good results and but little loss, it would not be well for the amateur to begin with more than fifty or sixty, always being careful just at dark to introduce the hand underneath the brooder and separate the chicks, spreading them evenly over the bottom of the brooder; they seldom move much after dark. This should always be done, and carefully, so as not to injure the chicks. The natural tendency of the chicks while growing is to crowd together, and while no great harm is done with but a dozen under an old hen, yet when that number is multiplied six or eight times great loss will sometimes follow. The great trouble is, the incipient grower, seeing trouble among his chicks and not knowing its cause, will always attribute it to the feed, which he will constantly change. We are in receipt of nearly 100 letters per day—many of them from parties who are losing their chicks—describing the changes and variety of the food they have given them, without an idea that their trouble can possibly arise from any other source. Now, I sympathize with these people deeply, for many of them are poor, depending upon their success in this venture for support for themselves and families, but I am powerless to help, except by a few generalities, for there are not hours enough in the twenty-four for me to do them all justice. In order to have chicks thrive it is only necessary to make the conditions as near right as possible. By keeping them a little hungry you will always keep them in exercise, which is one of the essentials. The next point is to adapt the

food to the size, growth and wants of the chicks as nearly as possible. When young, the muscle, bone and feather forming foods should be given and should consist largely of the albuminoids and the nitrogenous natures; later on, when getting the chicks ready for the market, the carbonaceous, for which there is nothing better than native corn. After the first few days I feed my chicks on soft feed three times each day, giving them between meals oatmeal, cracked wheat and barley, and, as they grow older, a little cracked corn; and as oatmeal becomes too expensive, the ration of cracked corn is increased and whole oats substituted.

WHAT TO FEED.

The soft food is composed of two parts cornmeal and one each of wheat bran and germ feed moistened with milk, if to be had. Milk may be given to drink freely after they are three weeks old, and in that case they will not need any animal food. Five minutes after the chicks have been fed the attendant should be required to go round and take up all the food carefully which the chicks have left. This should be insisted on, as it will soon learn him to feed carefully and no more than the chicks will eat.

The soft food should consist of equal parts of corn meal, wheat bran and germ feed, with a little of Bowker's animal meal or fine beef scrap, which should be previously soaked. If this food can be mixed with milk, animal food will not be required. Boiled potatoes, refuse cabbage and green rye should be fed at intervals; indeed, the greater the variety the better, providing it is fed in proper quantities. After the first day the chick should be fed outside the brooders. They should be taught to go outside the brooders for their food. I generally tap on the top of the brooder. The chicks will soon learn and come rushing out in a body for their food. The dry and granulated food may be scattered around among leaves and barn chaff and let the chicks find it for themselves. Should your chicks when a few days old begin to lose their appetite, appear listless and apathetic, show paleness around the eyes, you may be sure there is either too much heat or too

much crowding during the night. Insufficient ventilation will create the same trouble. Every few lines I wish to emphasize this: *Keep your chicks a little hungry. Feed no more at any time than they will eat clean. Keep their quarters dry, sweet and clean; and (to go back a little), have everything in their quarters all ready for them before they are hatched.* Have just received a letter from a party who has a 600-egg machine, coming off full of chicks, asking if he cannot keep them in his cellar for a week or two till he gets his brooding house finished, as the recent snow storm interrupted the work. I wrote him that the cellar was preferable to the snow outside, but to get them out as soon as possible. I fear there will be a great mortality among that man's chicks before he gets things properly adjusted. This will be quite discouraging, as he paid a fancy price for his eggs. After the first day or two brooders should be thoroughly cleaned and the material changed before it become offensive. It is simply astonishing how much filth and offensive material a lot of chicks and ducklings will generate in a short time, which necessitates cleaning up often and thoroughly. We read and hear a great deal about disinfectants. Now, I do not like that term. It implies a condition of things not desirable and savors of deodorizing filthy quarters. Now, our chicken coops should never require disinfecting. They should be kept clean and sweet enough without. The neatest and most particular of our poultrymen will sometimes get caught before they know it. A year ago I called upon one of our most successful poultrymen and noticed that his chicks were not looking as well as usual and spoke of it to him. He said he was aware of it but could not account for it, that he fed carefully, just as usual, that he sifted his sand out once or twice a week and took all the care he could. On being asked how long he had used that sand, said he had used it for several months. On taking up a handful and holding it to the face it fairly closed one's eyes, it was so strong of ammonia. It looked clean, but it had absorbed so much filth from the excrement of the chicks that the odor was destroying their appetites. I often find it necessary to mix in a little coarse, sharp sand in the

soft food, as the chicks though littered down with it often times will not touch it. Of course they cannot assimilate their food unless the gizzard is supplied with coarse sand or grit of some kind. A case of this kind occurred a short time ago. A lady called here last week saying she had a queer experience with her chicks. They were dying off very fast; had lost their appetites; were pale and listless; said she was completely at a loss what to do. When, on dissecting one, she found on opening the gizzard not a sign of grit of any kind, she thought that might be the trouble. It did not occur to her to mix a sufficient quantity with their food, but she took each chick and forced about half a thimbleful of coarse sand down its throat, a laborious process, but it proved effectual, as the mortality was stopped at once, the chicks recovered their appetites, and to use her expression, she "saved every one of them."

SANITARY ARRANGEMENTS.

As the chicks grow larger and the voidings multiply, they must be cleaned oftener, as it will not do to let them accumulate. When chicks are taken from the brooders, which should be when they are from four to five weeks old during the winter months (according as they feather out), and about three weeks during the months of April and May, I usually provide a lattice-work made of laths for them to roost on; this may be the length of the lath for width, and long enough to accommodate the chicks up to four or five pounds each; say twelve feet long for every 200 chicks. The framework should be about a foot or fifteen inches from the floor of the building, so the chicks can readily reach it; the laths about three-fourths of an inch apart so the droppings can easily fall through. This arrangement allows a free circulation of the air from below, should the chick crowd as they often will; it also obviates the warping and twisting of the breast bone of the growing chick and keeps them in much better health and condition than could possibly be done while roosting upon the ground. It is sometimes rather difficult to induce the chicks to mount this flat frame at first, as they had always much rather go under than on it, but by placing a few

of the larger ones on it for a few nights, the ambition of the rest will soon do the business. As the chicks increase in size, cracked corn may be fed freely, providing they have range. If confined, be more guarded in the food both in quality and quantity. Indeed, if allowed free range, cracked corn may be kept by them with no bad results. Fowls are very much like human beings in one respect. They are apt to place a very light value on that which costs them nothing. With the solid food available at all times they much prefer to range after insects and vegetable matter. It is very essential that the grower should watch his chicks carefully during development, in order that he may detect and anticipate any signs of trouble or appearance of debility in them. Should anything of the kind occur, he will know that a change of some kind is necessary either in food or management, and he will then be able to anticipate disease before it becomes seated.

As a rule, chicks do not require heat from the brooder more than four weeks, even in winter, unless the brooding-house is unusually cold. After the first of April, we do not allow the chicks any brooder heat when three weeks old; indeed, they are always taken from the brooders at that time to make room for the succeeding hatch, and placed in a building by themselves. As the Asiatics often feather out very slowly, it is well to sort out a few of the more naked ones, and coddle them a little, and they will soon come up when separated from the rest, as they often keep themselves bare by continuously crawling under the others to keep up warmth. It is simply astonishing how much growth can be got upon a chick when extreme care and the proper quantity and variety of food is used. I have one lot of 700 Light Brahma chicks, that came out the 29th of February. When five weeks old I weighed one of the larger ones, and he tipped the scales at twenty-one ounces. I intend that those chicks shall have the best of care until they are ready for market, which will be when they reach five pounds and over.

My stock chicks came out later, and, in fact, the eggs for that purpose are in the machines now—two large machines full—one lot just beginning to pip.

I have been getting out my chicks for winter layers much later in the season than formerly, for I have found that when carefully grown, the pullets commence laying at or before five months old, and, if got out too early, they are very apt to moult during the months of December and January, just when you want their eggs the most. Of course, this greatly impairs their usefulness, for, though a pullet does not moult as badly as an old hen, and recuperates much sooner, yet it interferes seriously with the business as well as the profits, as eggs are always at their highest about that time. Last season my stock pullets came out April 10th, commenced laying September 1st, and fully one-third of them moulted. This season they will come out ten days later, which, I think, will be much better. Of course, I could easily keep them back and check their growth by keeping them short and feeding them light, on an old cracked-corn system, and thus protract the time of laying, as well as effectually prevent moulting; but such a course would prevent the full development of the chick, place the cockerels upon the market much later in the season, and at a correspondingly reduced price, and not in so good condition; all of which materially reduces the profits on the season's work; and, lastly, but not least, young birds, when stunted in their growth, never attain the size or acquire the lustrous plumage of those under more favorable conditions.

As chicks increase in size, where large numbers are grown, there will always be some undersized ones that do not keep pace with the others in growth; in fact, they seem to be growing smaller. Of course, this is not the case, it is simply the others growing away from them. They are crowded aside when feeding, trodden upon during the night, and sometimes, completely denuded of their feathers; in fact they stand but little show anywhere among their more robust brothers. These should always be culled out and given a coop by themselves, when they will astonish one by their rapid growth, and, if taken in time, will usually make good chicks in the end.

PREPARING FOR MARKET.

When fattening chicks for market, they should be fed for

ten days or two weeks on more concentrated food, largely cornmeal mixed with animal food of some kind. I have found Bowker's Animal Meal to be the best and cheapest I have ever used. When chicks are in condition they should be killed at once, as their appetites will often fail them and they will become cloed if heavy feeding is persisted in long enough. Great care should be taken through all this to feed *no more* than the chicks will eat clean, as they will always eat more and fatten quicker, if this precaution is taken, than when food is kept constantly by them ; especially is this the case when they are confined in yards. When your chicks are ready for market, if you have but few of them, and no ready sale to consumers, it would perhaps, be as well to patronize local carts, which are always to be found in every neighborhood, and who are usually ready to pay fair prices for good chicks. There is now considerable competition among these gentry, and the prices are so well known among poultry growers, that they are obliged to do the square thing. Of course, where one grows chicks and ducks by the thousand, he cannot afford to patronize middlemen of that description, but should dress and market his own birds, if near enough; if not, he should patronize the best firms that deal honestly and promptly.

HOW TO SHIP.

One can hardly afford to ship produce of this kind at random, when, by the use of a little strategy, he will soon learn that there is a vast difference in the returns when the same article is shipped to different firms. For instance, we sometimes ship two boxes of dressed chicks to different parties on the same day, the quantity and quality being as near identical as possible. After having made several shipments of this kind, it does not take long to decide where to place your goods. I have sometimes known a discrepancy of eight to ten cents per pound on chicks shipped in this manner. One man will shrink your goods out of all reason, another will cut you on price, still another will decry the quality of your chicks that he may justify himself to you for his meagre returns. *Avoid all these* ; you will find honest

men enough in every department in life who will deal with their neighbors as they would with their own brothers, and these are the men to choose.

But first be sure of your part. Every young man entering the poultry business should build up his own reputation first of all. It will be of infinite advantage to him in selling his goods and dealing with others. His reputation for honesty and square dealing once established, he will then have enough to do to fill orders, not solicit them.

His poultry should not only be of good quality, but attractive in appearance as well. Procure only the best pickers to dress your fowls. Some pickers have a remarkable faculty for removing a large share of the skin from a fowl while they leave the largest share of the pins behind. Avoid all such, for your success, in a large measure, depends upon the quality and appearance of the goods you send.

While walking through Boston market last season, one of the prominent dealers asked me to step into his stall a moment, when he showed me a barrel, two-thirds full of dressed ducklings, just received from the country. The shipper had used a sugar barrel, around which had been pasted blue paper, and packed his ducklings just out of the water. As the barrel was not full and the expressman had inverted it a number of times during transit, the color had come out of the paper, innumerable little particles of paper had detached themselves from the sides of the barrel, while the ducks were plentifully smeared with both, and looked anything but appetizing.

"There," said the dealer, those are good ducks, but I shall have to cut that man five cents per pound for want of judgment, for I can never make those birds look salable." Another party had kept his ducks short for twelve hours, and then fed them on meal and beach sand, half and half, to make them weigh. The dealer told me that he took out fourteen ounces of the compound from the crop of one bird. The transaction was all over Boston market before night. It is needless to say that that man was spotted, and there is no longer any market in Boston for his goods. There is many a young man who has ruined his reputation by his sharp practice at the start, and has been obliged to drop what otherwise would have been to him a successful and lucrative business.

Do not pack first-class birds on the top of your shipping-box and refuse ones below; they will all have to come out,

and the object of the shipper to make his birds seem really better than they are, becomes known and his character exposed. Great care should be taken while dressing the chicks not to tear the skin, as it will always deface them more or less. If the chicks be killed by stunning them with a smart blow on the head, and bled by cutting the veins across the roof of the mouth, just below the eyes, they will not only be thoroughly bled, but will be disfigured by no cuts or knife-marks when the bird is nicely washed. The feet and legs of your chicks should be nicely washed as nothing looks worse than dirty feet and legs on dressed poultry. Natural defects can often be overcome by a little tact while dressing ; for instance, a first-class bird will often develop a very deep and prominent breast-bone (or center-board, as pickers term it), which injures its appearance very much. This bone can be crushed down by the hand, or a soft pestle, just after picking, in such a manner that, while it does not injure the chick at all, it shows up for just what it is—a good fat bird. Always ship first-class birds together, and your culls by themselves, notifying your dealer just what they are, so he will know just what he is selling. A few culls mixed with an otherwise good lot of chicks will often cut the whole two or three cents per pound, while sometimes the culls, by themselves, will bring nearly as much. Poor birds, when isolated, and carefully fed, can usually be fattened in good shape. When a person is growing and marketing chicks on a large scale, suitable and attractive boxes should be procured—boxes of different sizes that will hold just so many chicks. These boxes should always be full, for when not full, the chicks will always be more or less mixed and crumpled up during transportation, and present anything but an inviting appearance on their arrival in market.

WHEN TO HATCH.

Another thing of great importance is to know just when to get your chicks out to meet the highest prices in the market. We often hear of persons who contemplate entering the poultry business, say that they intend to run their machines the year round. This shows that they know little about what they have undertaken, little about the care, responsibility and intense application necessary to carry it on successfully. When a man's whole time and energies have been taxed to the utmost sixteen or eighteen hours of the day for six months of the year, he is generally willing to slack up a little the other six months, especially if he has made money enough to carry him through the rest of the

season, and a little over, which he is sure to do, if he runs his business intelligently. But this is not the only reason for shutting up his machines. Previous to, during, and just after the winter holidays, the prices on all kinds of poultry are usually much lower than at any other season of the year, as it is a season of the year when the public appetite is distracted by the immense quantities of turkeys, geese, spare-ribs, and all kinds of wild game; a season of the year when car-loads of all kinds of poultry, dressed or undressed are rushed across the line from Canada and all parts of the West; when every farmer selects his breeding stock for the coming season, and sends all his superannuated and indifferent fowls to market; in consequence of which the market is sure to be more or less glutted and prices rule low. Now, your experienced poulterer does not want to cater for this season at all, as his season's work should antecede this by several months, and his old hens, like his chicks, should go to market in the spring instead of the fall. For instance, good hens now, May 1st, readily command seventeen cents per pound. In the fall they will command from eleven to thirteen cents. They will then be moulting and off condition, and, if of the Asiatic breeds, will weigh at least one pound less than in the spring, making a difference of nearly fifty cents on each eight-pound bird. Of course, this discrepancy cannot be made up on cheap eggs during the summer; in fact, your bird hardly pays her way. We start our pullets to laying about September 1st, so as to have strong, vigorous and fertile eggs when we wish to fill our machines. We force them for all they are worth through the entire winter and spring, breaking them up whenever they show a desire to incubate; we usually get about one hundred eggs each from these pullets by the first of May, or by the time they are a year old. Of course, after repeated breaking up, the desire to incubate becomes intensified and more frequent, and the litters of eggs correspondingly less numerous; the struggle to induce a change of mind on their part of longer duration, requiring nearly a week, and at least two weeks more for the bird to recuperate and resume duty. By marketing these hens at this season of the year we realize nearly \$1.25 each; if postponed till fall, not more than seventy-five cents each—a discrepancy which would be nearly a dead loss. Another great advantage resulting from this method, is, that we immediately place our store chicks in the empty building, where they will become wonted and soon resume egg-production interrupted by the decease of their parents. This process is also more economical, as it requires less building room, the chicks being moved right from the brooders to the vacated houses.

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